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IT'S QUICKER BY TUBE

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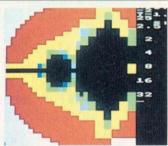
Martin Chaplin shows how to speed up data transfer across the Tube by including software in the Beeb and second processor to enable them to communicate with each other



EXPLORE THE MANDELBROT SET

80

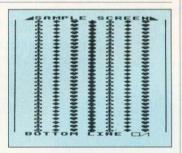
Generate amazing graphics using the Mandelbrot set technique – when you enlarge a minute area of a shape more and more detail is revealed – with David Johnson-Davies



DIY DUMPING

85

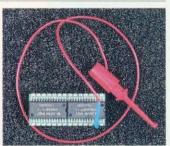
Our printer expert George Hill shows you how to dump user-defined characters on Epson and Epson-compatible printers and presents a printer dump program for character screens



COMPATIBILITY QUEST

89

Chris Drage answers readers' questions on choosing an expansion board. And on page 96 Simon Williams launches the *Acorn User* readers' ROM compatibility quest



COVER



Cover illustration by Paul Leith

NEW ADDRESS

Acorn User has moved offices. Our new address is Redwood Publishing, 141-143 Drury Lane, London WC2B 5TF. The phone number remains 01-836 2441.

NEXT MONTH

COMMUNICATIONS SPECIAL

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ACORN USER MAY 1986

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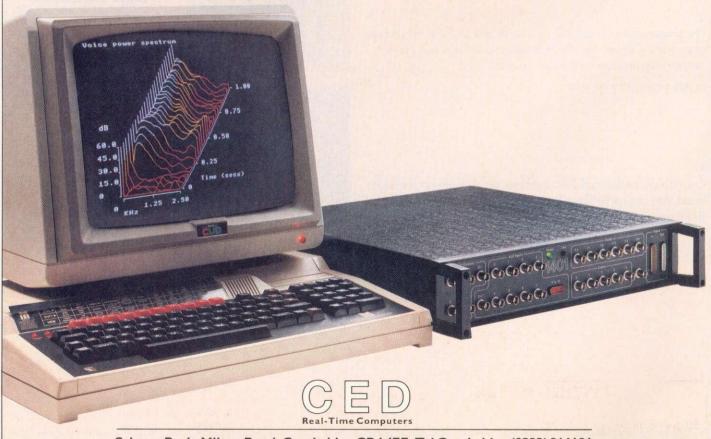
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TRADE ENQUIRIES INVITED



\ EWS

News in brief

• Incentive's Moon Cresta game offers the chance to win one of the original arcade machines. It runs on the Beeb and Electron at £7.95 on cassette and £2 extra on disc.

On the adventure front, Robico has released *Project Thesius*, a text-only follow-up to *Enthar Seven*. Electron and BBC B cassettes cost £9.95, with Beeb discs £11.95.

Also, the *Midge* text compression system used for the game is available on BBC disc for £11.95.

- Computer Concepts has cut the price of Wordwise to £36.80. The Plus version stays at £56.35. Versions 1.4D of Wordwise Plus and InterSheet 1.05 onwards work on the B, B + and Master.
- Tunemaker from March's Acorn User was one of the most popular free programs on Micronet. About 1500 people downloaded it. This month's offering is Peter Voke's Three Dee Shades program. See Noticeboard for page numbers.
- Opus has upgraded its Challenger combination disc drive system for the BBC micro to 512k of RAM disc from 256k plus a 40/80 track disc drive and double density disc interface. The price remains the same at £249.95. Opus Supplies (0737) 65080.

res

The shape of memory to come

Cumana – the company which made its name selling disc drives for BBC micros – has unveiled a revolutionary memory technique: a chip mounted on a credit card.

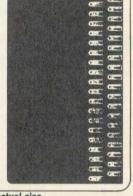
The Astron card, with inexpensive adaptors, will be in the shops this month, first of all in Dixons with a game for the Commodore 64. Initial products will be equivalent to 16k ROM chips, but RAM and EPROM versions are on the way, as well as a 128k product.

Price of the card plus interface will be about £24, with the cards themselves costing £5 – expected to come down to around £3 by December. A battery-backed version is under development.

Cumana is distributing the system for Japanese company Astar International under an exclusive European licence. General Instruments is pushing it in the US.

Astar has repackaged conventional chips by surface mounting them on a sheet of plastic. This is

the ultimate breakthrough in Information Storage Media



A 16k chip is embedded in this card shown actual size

already done in Acorn's cartridge software for the Electron and Master but it is the portability of Astar's system which is new.

The first interest in the UK has been from security companies, and the army. The Royal Engineers have been using the cards in the Beeb's serial cartridge slot on the left of the keyboard which is normally covered up.

Cumana's managing director

Don Bolton was extremely confident about the new system: 'We see it being very, very big and growing very fast.' He also saw it having revolutionary possibilities for computer hardware, even doing away with traditional RAM and ROM in micros.

The army, he said, was even looking into replacing the conventional 'dog tags' with a card, and the REME had set aside £1 million to develop the system.

At the launch last month Cumana was showing the cards working with BBC micros driving Alfred robots, and Superior Software's Speech software. Acorn was there with the Communicator, and talked about the possibilities of putting the card interface on the side of the machine.

Other big names mentioned in connection with the card were Sinclair – which is working on a portable micro called 'Pandora' – and British Telecom.

Acorn has taken one of the 100or-so development systems that have gone out, although had not had time to design the hardware.

Olivetti to compete with Acorn in schools

Olivetti has launched an IBM PC compatible micro in competition with Acorn's Master 512 for sale to schools.

The M19 will cost about £1400 and be available in May – three months before the Master 512 priced at around £900. Both machines will go into secondary schools to train pupils in business software – which is where the Olivetti machine has the edge as it has a much higher degree of IBM compatibility.

An Acorn spokesperson ex-

plained that it was a historical situation which was unlikely to happen again. In fact Acorn joint founder Hermann Hauser has just signed on with Olivetti as director of advanced research and development.

At the launch of the M19 micro, which uses the 8088 processor running PC-DOS and will run standard IBM software such as Lotus 123, Olivetti talked about porting BBC micro educational software on to the machine. However, Acorn was unsure as to its

involvement in this. Both companies put a brave face on the prospect of competing with each other. An Olivetti spokesperson told *Acorn User*. 'Obviously there is an overlap, but we'd rather see that than a gap'.

Acorn echoed the sentiment: 'We'd rather sell schools an M19 than see them go out and buy anything else'.

Acorn will 'make the M19 available', and it might well carry an Acorn badge, although a firm decision had yet to be taken.

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NEWS



Rats. All excited I was. When the Master was launched they said that the 512 version was based on the Motorola 68000 processor, didn't they? I know I didn't imagine it. Dancing in the streets. Jubilation on a cosmic scale.

However, back at the Acorn Strategic Offence Initiative head-quarters, dark plans were afoot to bring the Great British Public back under the yoke. 'Now zat ve haff ze enemy vell and truly drunk, ve go for ze killer blow. Ze next lot of adferts vill announce zat ze processor vill be ze 80186! Ha, Ha.' Same as the IBM PC. Argh! It's like being told that we didn't win at Waterloo after all.

I was at the annual masque ball of the regional chapter of the Ripoff Artists last week. As a guest/observer of course. It was interesting watching these fellows attempting to sell each other life insurance while nicking everything that wasn't nailed down. Discs, ROMs and tapes were moving around the room at flank speed. Similar to 'pass the parcel' except that the passing was involuntary. They seemed to enjoy the dare-devil thrills of sleight of hand more than the programs.

Still, it's not surprising when you consider the state of software. How many more ways are there of simulating the destruction of some poor alien who's probably got a family, mortgage worries and athlete's foot? The greatest innovation is in protection systems. Certainly the shadowy characters at the ball appeared happiest when telling how long it had taken to crack some elaborate piece of code.

I suppose it's like doing crossword puzzles really. I don't like them either.

Schools' unit has no staff

The new body set up to develop computer education in the UK, the Microelectronics Support Unit, has no director, no staff and no premises. The MSU was due to take over on April 1 from the Microelectronics Education Programme (MEP). Yet by that date the Department of Education (DES) had only appointed a board of 11 advisors and a chairman, Mike Nichol.

Without a director, the MSU cannot implement any policies. Without premises or staff the unit is unable to develop materials or provide practical advice to local education authorities.

Acorn User spoke to Mr Nichol

just two weeks before his unit was due to take over from the MEP.

He was confident that by the autumn the MSU would be fulfilling the role envisaged by Sir Keith Joseph, the education secretary – a small central support and advisory body. £3 million has been set aside for the MSU in the financial year 1985/6, as against the MEP's £4.5 million in 1984/85.

A former MEP employee said: 'It took the MEP five years to achieve its innovative position. The DES has undone all that work and it could be another five before the MSU is truly functioning in the way Sir Keith Joseph would like.'

Print-a-T-shirt

Instead of dumping your favourite images onto boring listing paper, why not emblazon them across your chest? Slot a transfer printing ribbon into your Epson FX70 or FX80 and text or graphics screens can be printed on a polyester or cotton T-shirt.

The ribbon costs £12.50 and is available from Banbury Business Computers, 3 Schofields Way, Bloxham, Banbury, Oxon.

Musical theory

Nebulae Micro Software has produced a music package for the Beeb which teaches the elements of counterpoint theory.

The software costs £22.95 on disc, and versions for Amcom or Econet networks cost £35.

Nebulae Educational Software, Kilroot Park, Carrickfergus, Co Antrim BT38 7DD.

New Star spotted

The latest addition to the Star range of printers is the NL-10. This dot-matrix printer costs £278, with a parallel interface, and as the name suggests is capable of Near Letter Quality (NLQ) printing at 30 characters per second.

In draft mode, the NL-10 runs at 120 cps. Other features include user-defined characters, an italic font and a headline mode where text is printed at double or quadruple height.

Star Micronics, 40 Uxbridge Road, Ealing, London W5 2BS.



Econet developed for businesses

Plans are afoot to take Acorn's Econet local area networking system out of its present educational niche and into the fast-growing business world.

SJ Research is developing a range of intelligent Econet interfaces for business machines, including the IBM PC which has half the business market.

Three interfaces are being planned, for each of the major computer connection bus standards, including SCSI, allowing

the Apple Macintosh to hook up to Econet; the VME bus, as used on Torch's Triple X range; and the IBM PC bus.

SJ Research is working with Torch, Acorn and several large users of Econet to define 'what can and cannot be done with Econet and business computers', according to Kim Spence-Jones, SJ Research's technical director.

Other Econet suppliers prefer to remain anonymous because, according to Spence-Jones, 'there's still a lot of stigma attached to Econet; a feeling that it is a toy network for schools.'

SJ Research is to release a more sophisticated Econet file server, MDFS, which will cost £1200 and will support four disc drives, a hard disc and a tape back-up.

A top-of-the-range HDFS file server with 80 MByte hard disc, tape back-up and triple processors costs £7200. Other new SJ products include a viewdata simulator for Econet and a menu system.

WE OFFERED THEM A CHALLENGER-THEY GAVE US

After testing the new 3 in 1 Challenger disc drive system from Opus Supplies, Britain's three leading BBC micro magazines were clearly impressed. After all Challenger is the fastest disc link-up ever with no complicated

interface connections, soldering or track cutting. No wonder this remarkable plug-in disc drive, double-density disc interface and super fast 256K RAM disc combination is currently taking the market by storm.

THE VERDIC

Opus have got a winner on their hands. If you are looking for a disc upgrade you can't go far wrong by buying a Challenger, even if you already have a single drive this would certainly be a sensible upgrade path. This certainly gets my vote as best buy of the year.

A & B COMPUTING - JANUARY 1986

RAM DISC PERFORMANCE

'Here is the pièce de résistance of the whole system - a 256 K RAM disc. I honestly don't know how Opus can do it for the price.

Using the RAM disc is a real dream with disc based applica-tions. Getting back to the actual performance of Spellcheck II, with the dictionary disc set up in the RAM disc, the result is amazing. When in automatic checking mode the text scrolls past so fast it is difficult to read. To put some figures on the improvement in speed, I checked a document just over 21 K long, which took 5 minutes 56 seconds on floppy and only 1 minute seconds using the RAM disc."

A & B COMPUTING

THE VERDICT

"At £249.95 inclusive you get the RAM disc, double-sided 40/80 track drive, Opus DDOS plus manuals and leads. Overall very good value for money, particularly if you are looking for a disc upgrade from scratch.'

ACORN USER - FEBRUARY 1986

RAM DISC PERFORMANCE

"The big deal comes in the speed. Being a purely electronic device, actions such as reading and writing are performed in fractions of the time a mechanic-

ally engineered disc drive takes.
To prove the point, I ran three programs on the RAM disc and the same three on the standard Opus drive with the following results (timings in seconds):

RAM DISC NORMAL 1 Save 32 K memory 0.34 2 BPUT 1 to 1000 1.14 13.69 1.14 3 PRINT/1000 strings 4.64

You don't need me to point out the huge speed increases.
ACORN USER

MICRO

"For the serious user Challenger could make file handling far easier and a good sight faster to use than a standard DFS as well as bringing a permanent end to 'is it 40 or 80 track, single or double density?' problems. In addition all the workspace used by a standard DFS is reclaimed and made available to the user by Challenger."
THE MICRO USER - FEBRUARY 1986

RAM DISC PERFORMANCE

'Of course it's not just a versatile disc drive, Opus also provides you with 256 K of RAM to play with. This RAM thinks it is a disc and the DDOS treats it as drive 4. If you have the 512 K version you get a drive 5 too. The RAM disc allocates sectors to files so that errors such as 'can't extend' are eliminated. In other words, it is a simple matter to use the RAM disc for most of your random access files then copy completed files from the RAM disc to a floppy

THE MICRO USER

RAM DISC WORTH £50



Challenger's price of £249.95 includes our un-beatable two-year warranty, a full operating manual, VAT and free delivery Call us now on 0737-65080 for details of our nationwide dealer network or simply post the coupon. Generous education and dealer discounts available.

CHALLENGER-STILL SIMPLY LIGHT YEARS AHEAD OF THE OPPOSITION

Please rush me the following: (PRICES IN	Challer III is a second
	Challenger Unit(s) £249.95 ea
I enclose a cheque for £	or please debit my credit ca
account with the amount of £	
My Access Visa no.	is:
NAME	
ADDRESS	

Competitions for schools

Schools using the *Music System* composing software can win an Epson RX80 printer or 40-track disc drive.

The System software house is offering four printers as first prizes – and four disc drives for the runners-up – to the composers of the best pieces of music produced using the software.

There are two categories, classical or contemporary, and the pieces must be less than three minutes long.

II O IS it

Closing date is May 12 1986 and further details are available on (0742) 682321.

Another competition has been launched by Michael Jay Publications for users of its *Cellmap* data collection software.

Prizes of educational software worth £160 are on offer to the most creative school projects which use the software. Entry form from MJP on (0795) 534690.

Beeb control unit

Claydale Electronics has produced a control unit for the Beeb which offers eight opto-isolated inputs and eight relay outputs.

The unit costs £165 plus VAT and up to eight of them can be plugged into the Beeb's 1MHz bus, giving 64 inputs and outputs. One Claydale unit can be powered from the Beeb, but extra ones will require a separate 5V supply.

Claydale Electronics, Unit 1, Bidewell Close, Drayton High Road, Norwich.

Z80 disassembler

Crossware Products has added a disassembler to its Z80 cross-assembler, which runs on the Beeb, B+ or Master 128. The new utility comes on a ROM and costs £69, and can now disassemble Z80 machine code – stored on disc or in RAM – into the full instruction set of Zilog mnemonics. Crossware Products (0763) 61539.



School modem scheme on-line

by Bill Penfold

The Government has increased new funds for putting a modem in every middle and secondary school by 50 per cent because of the sheer scale of the response to its scheme.

In less than a week after the scheme was unveiled by Information Technology Minister Geoffrey Pattie, more than 5000 schools had snatched up the offer, and the overwhelming majority of these orders are to put school BBC micros on line. Now an astonished but delighted Mr Pattie has increased the original £1 million funding to £1.5 million.

Under the scheme schools have been offered free modems plus software, with the promise of a National Computerised Information Service (NERIS) being established for schools before the end of the year. This will initially cover the curriculum areas of maths, science and geography, with other subjects being added.

Whitehall officials had expected some 9000 to 10,000 schools to take up the offer, but the enthusi-

astic reaction meant that within days this was revised up to an anticipated 12,000.

The Department of Trade and Industry (DTI) expects that just about every secondary and middle school will have a modem within the next few months.

Two types of modem are being supplied – both of which are already extensively used in some schools – the Tandata 512 and the Dacom DSL 2123AD, normally costing around £200 but which the DTI has bulk-purchased for £110 each.

From mighty Acorns little Beebs grow

Yes, that's a real £1 coin behind the diminutive BBC micro (left) – monitor, copy of *Acorn User* and user guide are all faithfully reproduced at the same 1:10 scale.

This Lilliputian feat was accomplished by AU reader Peter Clements, who has been making models as a hobby for seven years.

The Beeb is cast in resin from a mould, and the master took a painstaking two weeks to carve out of epoxy putty. The mould has also been used to cast Beeb badges (AU January).

The monitor lights up, thanks to an internal bulb, but the *Revs* screen is unfortunately static – it's simply a colour transparency of a full-size screen shot.

The user guide and copy of AU were reduced photographically and the spiral binding is made from fuse wire.

Acornsoft wanted to buy the mini micro and its puny peripherals but said Peter: 'It was just a one-off and is definitely not for sale'.

Micro adventures

Children's adventure holiday firm Dolphin is offering BBC micro computing as an option in its multi-activity adventure centres.

Dolphin, Grosvenor Hall, Bolnore Road, Haywards Heath, West Sussex RH16 4BX.

Graduate's Soft Option

Torch Graduate owners have a new company to go to for support called Soft Options.

The Graduate add-on offers IBM PC compatibility to Beeb owners, and Torch has always maintained that because it runs a large range of IBM PC software there is no need to produce software specifically for the Graduate.

However, A Sherman, one of the Graduate's designers, thinks differently and has set up his own company, Soft Options, to provide a 'much-needed' service for Graduate owners.

Its first release is a £40 utilities disc of seven programs, including one to convert MS-DOS files to Acorn DFS format, and a disc copier which exploits the Graduate's 1770 disc controller chip.

Soft Options, Century House, Swavesey, Cambridge CB4 5QG.

ach |

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Computers



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	Eprom Cartridge	£14.95
	Welcome Guide	£10.00
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	Z80 Second Processor	£379.00
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ECONET ACCESSORIES 100in Cable £89.00 £29.00 10ft Lead Set Econet Starter Kit

£99.00 Econet Bridge Level I Fileserver 40 Track £199.00 £99.00 Level 2 Filesaver 80 Track £235.00 Print Server Eprom £49.00

Disc Drives

DISC DRIVES

User Friendly Disk Drives 100% BBC compatible slimline disc drives. All drives are supplied complete with formatting diskette, comprehensive users manual and all necessary cables. All drives are 40/80 Track switchable at the front and have

two years warranty. 51/4" Drives without P.S.U.

MD 400A Single 400K Double Sided £105.00 MD 802C Dual 400K Double Sided £189 00

51/4" Drives with P.S.U. MD 400B Single 400K Double Sided £129.00

MD 802E Dual 400K Double Sided

SPECIAL

MD 802D Dual 400K Drives horizontally mounted in a monitor stand to fit both the BBC B and the Master series. £255 00

OPUS CHALLENGER B

A remarkable plug-in disk drive double density disc interface and superfast 256K RAM Disk with a full operating manual and unbeatable 2 year warranty. £240.00 £240.00

CUMANA

CSX 100 (100K) 1 x 40 Track Single Sided Drive Excl. PSU SCS X 400 (400K)1 x 80 Track £79.35 Double Sided Drive Excl. PSU £113.85 CDX 800S (800K) 2 x 80 Track Double Sided Drive Excl. PSU £199.00 CS 400 (400K) 1 x 80 Track Double Sided Drive Incl. PSU £135.00 CD 800S (800K) 2 x 80 Track Double Sided Drive Incl. PSU **£239.00** Mitsubushi (400K) Single Disk Drives Case 40/80 Track Switchable with two years warranty.

Monitors

MONOCHROME MONITORS

Phillips BM 7502	CIVITORS
Green Screen Phillips BM 7522	£79.00
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Hi Res Green Kaga KX 1203G	£120.00
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Hantarex Box 12" Dark Glass Etched Green Screen Monitor superb value

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Std Re		£224.25
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RGB a	ind Audio inpu	f £209 00
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screer	composite vid	leo input RCR
and A	udio Input.	
und A	auto imput.	£289.00

SPECIAL OFFER

Mitsubushi 1404 Medium Resolution Monitor with 640 X 200 Pixels RGB available with IBM or £239.00



Kaga Super Vision III Kaga Super Vision /// £369.00
This display is designed for business use which provides both high-res monochrome (Green, Amber, and White reverse) mode and high-res Colour graphic mode Optional tilt stand with Quartz

Clock is also available.

TV MONITORS

Phillips 1114 colour TV/monitor with 14" tube offedring 10 Preselect channels RF CVBS and RGB £199.00

64K Upgrade Kit	£39.95
17/70 Upgrade Kit	£49.94
ADFS ROM	£29.95
Disc Upgrade Kit	£89.00
Econet Upgrade Kit	£49.00
Speech Upgrade Kit	£49.00
DNFS ROM	£20.00
	1

TCL Special Package

The TCL All in One Word Processing Package contains a Master 128, View 3.0, Viewsheet, High Res Green Monitor, 800K Dual Drives with PSU, Quendata Daisy Wheel Printer together with a box of Discs, Paper, and all the Cables. £914.25

Modems

NIGHTINGALE MODEM Including Commstar

£130.00

and Comprehensive

Auto Dial/Auto Answ Board Auto Dial Utilities Dia OBBS Bulletin Softw	£55.00
DEMON MODE With its Devilishly CI	
Auto Dial, Auto Redial, Auto Answer Full and Half Duplex	PROHIBITED from down to reduce the reduce the reduce to reduce the r
European and USA S	tandards

Complete with Power Supply eads and Manuals Full Baud Rates Demon with BBC ROM Dial Disc

Disc double sided density 96 TP 1 uses 3m Media Guaranteed for life. Free library

TCL Special Workstation



Once again TCL has answered a special need of all BBC Computer users with the new mushroom workstation. No more untidy wiring or pulled plugs.

Transforms your system into a Handsome Console Unit.

FEATURES INCLUDE:

Advanced cable management Twin 400K Mitsubushi Slimline drives switchable from 40 to 80 track with status indicator LED's On board regulated 4amp power supply with overload protection Mains input filter for clean power supply

Filtered power to the 3 take off sockets at rear for Micro, Monitor, and Printer. Mushroom Workstation

Printers

DOT MATRIX PRINTERS NOW AVAILABLE

Juki 5510 - Gives you 180 CPS & NLQ Standards £269.00 Inc. VAT

and thats not all! The Juki 5510 also has full graphics mode, two position 'dip-switch' (providing instant compatibility with both the Epsom and the IBM Graphic Printer). Standard 2K memory (expandable to 14K) built-in Parallel Centronics interface and 8-switch international character sets. If you need colour too, so Juki 5510 Colour Kit gives you £112.00

CITIZEN 120 D

This new citizen 120D with 120 CPS and 25 CPS NLQ comes with tractor and friction feed as standard. IBM and Epson Compatible with TWO years Warranty £159.00

CITIZEN MSPIO

The new citizen MSPIO with 16 CPS Draft and 40 CPS NLQ. With TWO years Warranty

KAGA KP810

The 80 column printer with 140 CPS Draft and NLQ with friction and tractor feed offering 9 INT character sets. Long life cartridge ribbon and standard centronics interface. £195.00 Also available KAGA KP 910 (wide carriage printer) £379.00

CENTRONICS GLP

Complete with Tractor Adaptor offering 50 CPS Draft and 12 CPS NLQ £125.00

EPSON LX80

With 100 CPS draft and 16 CPS NLO and optional tractor adaptor and sheet feeder. This printer has a standard parallel connection and accepts all other Epson serial Parellel boards with external dip switches for easy access and internal IK buffer. It offers a high specification at a low price. £229.00

ALSO AVAILABLE

Epson FX 80	£365.00
Epson FX 100F/T	£495.00
Epson FX 85	£369.00
Seikosha GP 50A (Parallel)	£69.00
Seikosha GP 50S inc.	
Printer I/F + cables	£69.00
Seikosha 1000A (NLQ)	£199.00
Canon PW 1080A (NLQ)	£269.00
Canon PW 1156A	£379.00
	£228.00
Shinwa CP 80A	£189.00
MP 165	£240.00
Star SG 10	£219.00

SPECIAL OFFER OF THE MONTH

Brotner HR 15	£349.00
Juki 6100	£285.00
Juki 2200	£275.00
Juki 6300	£799.00

DAISYWHEEL PRINTERS

QUENDATA DWP 1120 with optional tractor/sheet feeder and 13" paper with facility.
This Daisywheel printer with 20
CPS has 96 character printwheel compatible with the QUME. Standard centronics interface (optional RS232 C) £169.00

COLOUR PRINTERS

Canon PJ1080A £440.00

Printers

TRACTOR ADAPT	TERS
FX80	£33.00
LX80	£23.00
Juki 6100	£129.00
Juki 6300	£129.00
Quendata DWP 1120	£114.00
Brother HR 15	£95.00
SHEET FEEDER	

Juki 6100 Juki 6300 Quendata DWP 1120 £173.00 £165.00 Brother HR 15 £212.00 £55.00

PRINTER RIBBONS	
Brother HR 5	£3.45
Brother EP 44	£2.65
Brother M1009	£4.60
Brother HR 15/25	£5.45
Multi-strike	
Brother HR 15/25 fabric	£4.85
Canon PW 1156A/1080	£6.85
Daisystep 2000 Multi-strike	£4.00
Daisystep 2000 fabric	£6.30
Epson FX/MX/RX80	£4.50
Epson LX80	£4.90
Epson MX100	£5.80
Epson LQ1500	£6.60
Epson DX multi-strike	£5.40
Epson DX 100 fabric	£4.85
Juki 6100 mulit-strike	£3.20
Juki 6100 single-strike	£1.95
Juki 6300 multi-strike	£3.05
Juki 6300 fabric	£4.10
Juki 2200 single-strike	£2.95
Juki 2200 correctable	£2.88
Kaga KP 810/910	£6.85
MP165	£4.50
OK 1 microline 80/82/83	£2.07
Quendata 2000 Multi-strike	£3.97
Quendata 2000 fabric	£6.30
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Seikosha GP80	£4.00
Seikosha GP 100/250	£4.30
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Shinwa CP80 multi-strike	£5.50
CP80 fabric	£5.46
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FONT AID	

NLQ Designer for Canon and Taxan KAGA NLQ Printers.
Design your own NLQ Fonts or download one of our 20+ predifined fonts. The Fontaid Disk includes the following type styles:-Square, Outline, Gothic, Bold,

Computer Type, Bold Shadow, and Broadway. Additional Disk 'A' Includes:

Greek/Matus Script, P.S., Plain Handwriting, and 2 styles of Elite, Condensed, & Super Condensed. Fontaid requires 6264 RAM CHIP in print. Fontaid BBC



Now available Taxan Multipurpose Type Printer Buffer KIF-4308 compatible with any Centronics interface

Accessories

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The flexible videotex syst	em with
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BBC lead	£24.95
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DATAPAD Keyboard	
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Firmware

FIRMWARE

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Acorn BCPL	£99.00
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View Store	£52.00
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BASIC Editor	£28.00
Termulator	£31.95
Microprolog	£69.95
COMCONCEPT	
Wordwise	£36.00
Wordwise Plus	£46.00
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Disk Doctor	£27.00
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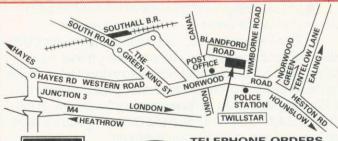
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CUB'S COLOURFUL MASTER PIECE



corn's BBC Master Series bring exciting new levels of sophistication to a proven family of micro computers. Unfortunately, not all monitors on the market can do justice to the Master Series' colour display capabilities.

That's why more BBC users choose a Microvitec CUB colour monitor than any other - because every model in the CUB family is a masterpiece of high performance British design. The clarity, depth of colour and rock steady image seen on a CUB display allows the user to exploit graphics and text to the full - just ask for a demonstration of a CUB alongside someone else's monitor and you'll be totally convinced.

In the meantime, the picture above amply demonstrates why a CUB is a delight to the eye in more ways than one.

Model	Resolution	Screen	Bandwidth	Application
1431/DS4	Standard 452(H) x 550(V)		18 MHz	Education, Home, Colour
1451/DS4	Medium 653(H) x 550(V)	Anti-glare	18 MHz	graphics use 80 column, text-processing.
1441/DS4	High 895(H) x 550(V)	Anti-glare	18 MHz	High quality graphics. High-resolution graphics and text applications.

Available with tilt and swivel op 'on. Also available are Microvitec's range of popular BBC-compatible metal cabinet monitors 1431/MS, 1451/MS4, 1441/MS4.

TOUCH SCREEN OPERATION

Touchtech 501, designed for operation with all CUB metal cabinet monitors - the ultimate in user friendliness.

COMPATIBLE For free, full colour brochure contact



Futures Way, Bolling Road, Bradford BD4 7TU, West Yorkshire. Tel: (0274) 390011/726500. Telex: 517717 MVITEC G

Available from High Street Computer Retailers and branches of W. H. Smith, Boots, John Lewis Partnership, Laskys and Currys.

Instant video digitising for the Beeb

Wild Vision has produced a realtime image processing system for the Beeb – the Hawk V8.

The unit costs £970 and stores video images from a monochrome camera in the Beeb's screen memory. Direct memory access (DMA) means that the screen memory is continually updated without burdening the processor.

Unlike cheaper picture digitising systems for the Beeb which scan the image, the Hawk works in real-time, grabbing the image almost instantaneously and displaying it in either mode 0 or mode 2.

The system has already been used for a medical application – studying foot pressure patterns –

and Wild Vision sees other applications as security systems, CAD, industrial inspection and scientific image analysis.

Hawk V8 comes as a board, which sits inside the Beeb's case, and image processing software.

Wild Vision, MARI House, 20-22 Jesmond Road, Newcastleupon-Tyne NE2 4PQ.



Roma: £4000 from death

The life of Roma the tigress is still in the balance, with £4000 needed before the end of April.

Acorn employee Martin Grantham single-handedly took on the mammoth task of raising over £20,000 to build an enclosure at Linton Zoo, Cambridgeshire for Roma, who was made homeless when Knaresborough Zoo closed (AU March).

Response to his appeal has been tremendous, with £17,000 raised by early March – with AU readers contributing £750-£1000.

£4000 is still needed, but Mr Grantham is confident he will raise it. If he can't, the RSPCA will put Roma down.

Donations to The Save the Tiger Fund, Midland Bank, 52 St Andrews Street, Cambridge CB2 3AH. A/C no 41118722, sorting code 40-16-36.

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Some of the type styles available in Clares' Fontwise Plus – not shown to actual size

Clares adds fonts to printer driver

Clares has released six new pieces of software for the BBC micro and Master series.

Fontwise Plus improves the existing Fontwise printer driver so that it now works with View files, in addition to Wordwise and Wordwise Plus. The program allows text files to be printed in 12 type styles on an Epson-compatible printer. Cost is £20.

Macrom is a macro assembler for all Beebs including the Master 128, priced at £40. It will assemble 65C02 code as well as 6502.

Another upgrade, Brom Plus enhances the facilities of Clare's

Brom toolkit ROM, which has been reduced to £20. The new version costs £34.50 and has utilities for discs and memory as well as Basic utilities.

Statement and Stock Control are the two latest additions to the Beta Accounts integrated accounting suite at £25 each.

Finally, Clares has put six of its best educational programs on one disc. Educational Compendium costs £12 — buying them separately would set you back £32.

Clares Micro Supplies, 98 Rudheath Road, Rudheath, Northwich, Cheshire CW9 7DA.

POST A PROBLEM

AS a result of pressure from readers, Acorn User now guarantees a fast reply service for enquiries. Your answer will be returned within 10 working days for just £2 (includes VAT), or your money back.

The idea is simple. Just write out your problem, fill in the coupon (right), and send both off to *Acorn User* with a stamped addressed envelope and cheque or postal order for £2. (If you want recorded delivery, add the cost of this on. The same goes for overseas readers.) Include as much detail as possible and a disc or cassette if a program is involved – with enough space to record any corrected listing.

We will then answer the problem and return all material received – within a guaranteed 10 working days from receipt. If we fail to match this promise your cheque or postal order will be returned with the answered question. If we cannot answer the problem, the cheque will be sent back to you.

If you want a listing debugged, advice on hardware or software, or a list of addresses, send us your problems.

ACORN	USER	READ	ER SEI	RVICE
141-143 Di	rury La	ne, Lon	idon W	C2B 5TF

Name
Address
Postcode
Daytime phone number
I enclose a cheque/postal order for £2 and an sae with my
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Date out:

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NOTICE BOARD

ON SHOW

- 7-9 July, Third Insurance Information Exchange, Connaught Rooms, London WC2. Specialist exhibition including hardware and software for the insurance industry. More details from Caroline Fletcher on 01-242 5275.
- 9 July, Computers in Science, Lancaster Polytechnic, Preston. This event, which is part of a course for further education teachers, will be open to the public. Potential exhibitors contact Mrs Minall at the Polytechnic's Business and Industrial Centre.
- 24-27 July, Acorn User Exhibition, all the experts from *Acorn User* will be on tap at the Barbican in London. More details next month, and see the advertisement in this issue.
- 6-11 August, Festival Expo 86, Computers, Video Software and Games Exhibition, Stoke-on-Trent, Staffs.

One of twenty exhibitions being held between May and October as part of this year's huge National Garden Festival. Over three million visitors are expected to visit the festival's purpose-built 180 acre garden site during the five months it is open.

FOR HELP

- To contact Acorn User authors, write to them c/o our new address: 141-143 Drury Lane, London WC2B 5TF.
- Remember you have until May 11 to register with the Data Protection Registrar if you are a business micro user who processes information about individuals. It costs £22 and failure to register is a criminal offence under the Data Protection Act, 1984.

Contact the Data Protection Registrar, Springfield House, Water Lane, Wilmslow, Cheshire SK9 5AX for advice and details.

Seikosha AP/GP100 printer help sheets are available from Acorn User for 50p, plus sae. These consist of three programs, including a screen dump, and three pages of notes on using these printers.

TO CONTACT

- Acorn, Fulbourn Road, Cherry Hinton, Cambridge CB1 4JN.
 Tel: (0223) 245200.
- Acornsoft, 645 Newmarket Road, Cambridge CB5 8PD. Tel: (0223) 214411.
- Acorn's bulletin board service is Prestel-compatible (1200/75 baud) and runs on (0223) 243642.
- Acorn User cassettes, discs, back issues and binders are available from PHS Mailings on (02934) 72208 (see page 104).
- Acorn User's page number on Micronet is 60043765. You can download AU software on 600611.
- BBC TV's Micro Live bulletin board is on 01-579 2288 (type INFO BBC on Telecom Gold electronic mail system).
- BBC Computer Literacy
 Project, Broadcasting Support
 Services, PO Box 7, London W3
 6X J. Please send sae.
- British Amateur Radio Teleprinter Group (BARTG) specialises in keyboard communications including RTTY, AMTOR (Amateur Telex Over Radio) and packet radio. BARTG also provides terminal unit kits and other communications hardware. For more details contact: Stuart Dodson, BARTG Chairman, G3PPD, 63 Malvern Avenue, South Harrow, Middlesex.
- Bulletin Boards: Two new bulletin boards are now available. BB-BBS (Brecon Beacons Bulletin Board Service) offers free software and hints and tips. The board operates on 300/300 baud and is currently open between 8pm and 8am on (0874) 730692. On-Line Systems Bulletin Board gives details of Hartlepool Computer Services range of new and second-hand computers. It operates on 1200/75 baud on (0429) 234346.

Other boards: BB-BBS (0874) 730692; CABB 01-631 3076; CBBS London 01-399 2136; Distel 01-679 1888; Forum 80 Hull (0482) 859169; Forum 80 London 01-399 2136; Grendel (0532) 620334; HAM-NET (0482) 497150; Liverpool Mailbox 051-428 8924;

Mailbox 80 (0384) 635336; POT-BUG (0782) 503254; On-Line Systems (0429) 34346; Owltel (BBC Publications) 01-927 5820; Technomatic 01-450 9764; TBBS London 01-348 9400; TBBS Nottingham (0602) 289783; TBBS Southampton (0703) 437200.

- MAPE (Micros and Primary Education), c/o Mrs G Jones, 76 Sudbrooke Holme Drive, Sudbrooke, Lincs LN2 2SF.
- MUSE (Micro Users in Schools and Education), PO Box 43, 231/2 Friary Chambers, Whitefriargate, Hull HU1 2HD. Tel: (0482) 20268. User group for teachers and parents. Please send sae.
- National Extension College, 18 Brooklands Avenue, Cambridge CB2 2HN.
- © CET (Council for Education Technology), 3 Devonshire Street, London W1N 2BA. Please send sae.
- © Software Limited configure CP/M programs for the BBC micro. Write for a catalogue to No 2 Alice Owen Technology Centre, 251 Goswell Road, London EC1N 7 JQ. Tel: 01-833 1173.

USER RAM

Our thanks to Sebastian Lazareno of Ware, for telling us how to make the 16k Acorn User UserRAM work with the popular APTL ROM board.

The solution is simple, just make (ie connect) link 6 on the APTL board. This switches the write-protect facility from slot 15 on the APTL board (used for RAM) to the rest of the sockets on the board. Ideally a switch should be included in the link to allow you to switch the write-protect on and off as required.

BLUNDERBOX

• A line managed to get cut out of the April edition of First Byte, the line in question is:

470 FOR pass=0 TO 3 STEP 3

Our sincere apologies to you and our thanks to Gordon Sheppard of London for pointing it out.

Apologies for two bugs that crept into Tunemaker (March). Lines 710 and 1230 should read:

710 IF notune% THEN PRINTT AB(2,30) "NO TUNE IN MEMORY": i%=INKEY(300):60TO 750 1230 IF key\$="C" OR key\$="C" THEN PRINTTAB(32,5);SPC(5):INPUTTAB(32,5),tempo%

● Thanks to Jon Thackray for pointing out the error in the Master review on page 75 of the March issue. When specifying a filing system as part of a filename, the filing system name should be enclosed by hyphens, eg:

100 LOAD "-DISC-PROGRAM"

Sorry! Mike Rawlings' article Sideways Storage in March contained a number of errors.

In the third paragraph on page 85 we stated listing 2 was the Tube compatible version – it should have read listing 3. And the caption to listing 2 on yellow page 114 should have read: 'Listing 2. A program for use on a Solidisk board'.

On page 86, 10 lines from the bottom of the first column, the listing line numbers should have read 902 to 909 not 1100 to 1170. Alternative lines to adapt integer read/write routines to handle two byte or three byte variables were missed from the yellow pages and you'll find them here:

Listings 1 and 2 -two bytes

1240 !&90=t+n*2:7&92=bk:7&93=2: !&94=v 1300 !&90=t+n*2:7&92=bk:7&93=2 1320 =!&94 AND &FFFF

Listings 1 and 2 - three bytes

1240 !%90=t+n*3:?%92=bk:?%93=3: !%94=v 1300 !%90=t+n*3:?%92=bk:?%93=3 1320 =!%94 AND %FFFFFF

Listing 3 - two bytes

1930 !&255=t+n*2 1950 ?&258=2 2020 !&255=t+n*2 2040 ?&258=2 2060 =!&259 AND &FFFF

Listing 3 - three bytes

1930 | %255=t+n*3 1950 | %255=t+n*3 2020 | %255=t+n*3 2040 | %258=3 2060 = !%259 AND %FFFFFF

Listing 4 – two bytes

1930 !&250=t+n*2 1950 ?&258=2 2020 !&255=t+n*2 2040 ?&258=2 2060 =!&259 AND &FFFF

Listing 4 - three bytes

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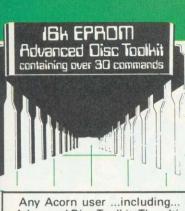
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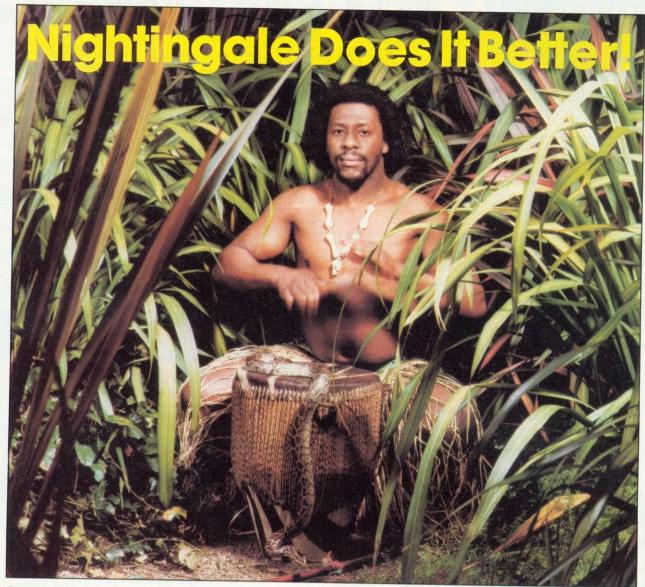
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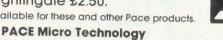
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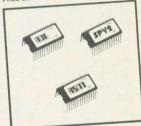
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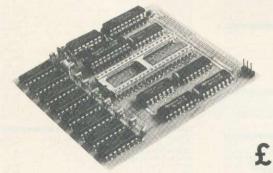
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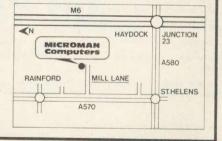
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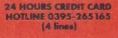
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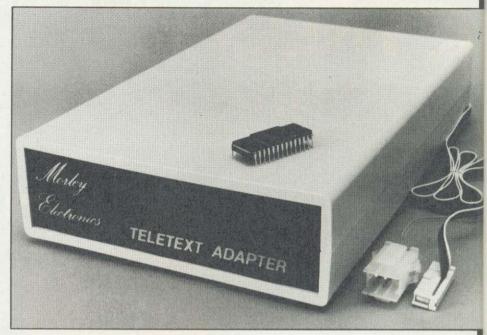
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- Gives you a real-time clock at your disposal (*TIME).
- Free software upgrades to allow for any enhancements to the teletext service. Eg: extra channels, full field data on cable & satellite systems etc.
- Easy to follow comprehensive user guide.

- No hardware limitations, it can for example receive virtually unlimited numbers of channels.
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- Utils disc available including printer drivers allows pages to be selected and dumped direct to a printer (no more TV or Radio Times to buy).

ELECTRON TELETEXT ADAPTER
Electron adapter now available, including
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Easily the best value Mode 7 screen designer on the market today.

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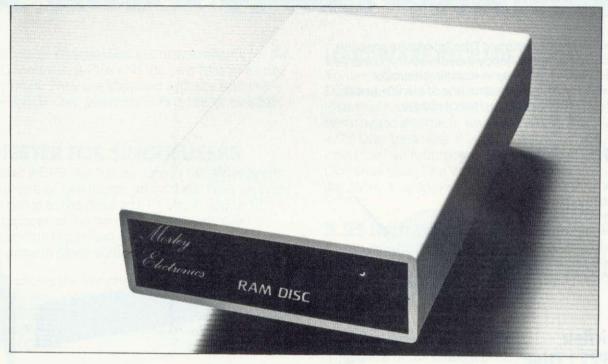
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Now available the first true MEGA capacity RAMdisc for the BBC or MASTER computers

This fully compatible unit, currently available in either 1 or 2 megabyte versions comes complete with operating software on ROM, power supply, battery backup and a comprehensive user guide, add to this our usual 12 months no quibble guarantee and we're sure you'll agree Morley have done it again.

1 Megabyte of RAM connected to the 1 MHz bus.

Used with the supplied ROM software programs and files may be saved and loaded from the RAMdisc in the same manner as from a floppy disc with a large increase in speed, for example, a 20K mode 0 screen takes about 3-4 seconds to load from disc and about 0.2-0.3 seconds to load from the RAMdisc.

The RAMdisc ROM operates as a utility ROM working with the current filing system rather than as a separate filing system.

Therefore ensures compatibility with any DFS.

The RAMdisc can be selected by a * command to take the place of any drive number from 0 to 9. If the RAMdisc replaces a floppy drive as 0 for example, all commands addressed to drive 0 will be intercepted by the RAMdisc. The default drive no. is 4. 'Dangerous' * commands such as *COMPACT, *COPY, *BACKUP etc are intercepted and the BBC's RAM from page 2 to &7FFF is saved to RAMdisc workspace, and may be recovered using a * command. This prevents accidental corruption of any programs/data in RAM you may have been using at the time. The save operation delays the * command by just under 0.4 seconds. The BBC's RAM can also be saved by an interrupt-driven routine which can be

enabled by a * command. The 'filing system wedge' ROM supplied supports load/save, byte file access, all relevant OSFSC commands, and contains a formatter, verifier and 'sector' editor for use with the RAMdisc.

APPLICATIONS

Programs and ROMs can be written to take advantage of directly accessing a single RAMdisc, allowing the possibility of spreadsheets with more than 512 × 512 cells, million-character documents with immediate access and editing of any section, manipulation of 2 floating-point arrays each with 228 x 228 elements, a fast-access database with 10,000 100-character records, or even just a large

Accessible through the user's software for direct storage of eg: basic procedures, variables, large arrays etc which can be downloaded into the BBC's RAM or read directly. (We are hoping to be able to supply an extended basic ROM late this year, to allow 'transparent access' to the Ramdisc, which will effectively expand the BBC's RAM to about 1020k.)

OPTIONAL SIDEWAYS RAM UTILITY (suitable for use with any 16k SWR)

Sideways ROM images can be saved to the RAMdisc under a special directory which, when enabled, will be used when an unrecognised * command is trapped for the ROM to load sideways ROMs from disc into sideways RAM. The * command will then be passed to the new ROM image and if still unrecognised the next ROM will be loaded. If no ROM loaded from the RAMdisc intercepts the * command it will be passed to the current filing system as usual. ROMs on RAMdisc can be individually disabled in the same manner as 'real' ROMs in the BBC itself. Up to 104 8k ROMs can be saved onto the standard 1Mb RAMdisc, and the total load time (excluding time taken by the ROMs to process the command) for 100 ROMs is just under 9 seconds. All relevant control software for disabling/enabling ROMs etc. is provided. (Supplied on ROM.)

EPROM PROGRAMMER now available programs 8, 16 and 32k EPROMS connects to the user port software available on rom or disc.

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Solidisk offers well designed Disc Interfaces enabling your computer to use floppy disc drives. If you feel you would have any difficulty in installing it and/or adding disc drives, you can contact one of our 90+ Local Experts who will install it for you free of charge.

The 1770 Disc Interface

The Solidisk 1770 Double Density Disc Interface has only four components and can easily be fitted even by a novice. The 1770 Disc Interface is supplied with Solidisk 2.2 DFS ROM.



The Solidisk 1770+8271 Disc Interface

If you already have a 8271 Disc Interface, then the Solidisk 1770+8271 Interface will give you the best of both worlds. You can select either the 8271 or the 1770 at a flick of a

switch. The 1770+8271 Interface is supplied with the Solidisk DFS+ADFS ROM set. This is available in two 16K or one 32K ROM.

Features built into ROM	DFS 2.2	ADFS
Disc formatter	yes	yes
Disc verifier	yes	yes
Memory editor	yes	yes
Disc sector editor	yes	yes
Disc copier	yes	yes
Recover & Restore	yes	yes
Read track & Write track	yes	yes
Run 8271 floppy disc controller	yes	no
Osword 7F emulator for 1770	yes	yes
Tape to disc	yes	yes
Download	yes	yes
DFS files to ADFS	no	yes
ADFS files to DFS	no	yes
40/80 switching for 80-track drives	yes	only in DFS
Solidisk Winchester	no	yes
6502, Z80 and 32016 compatible	yes	yes
Read & Write IBM-PC DOS discs	yes	yes

Both the DFS and ADFS have every facility that you would expect. They can run most protected software, such as Elite, Castle Quest, Island Logic's Music System etc. Other features include read after write, and the option of double density operation (with the 1770 chip) giving 60% extra storage capacity. Their compatibility with all Acorn Second Processors (6502, Z80 and 32016) and Econet File Server (Level 2), and their capability of reading from and writing to IBM-PC DOS diskettes (with the 1770 chip) reflect the broad range of applications supported. Both 1770 and 1770+8271 Disc Interfaces are compatible with Acorn 1770 DNFS and ADFS ROMs.

The DFS and ADFS ROMs can be used to enhance both standard Acorn 8271 or 1770 Disc Interfaces, on the BBC Model B or the B Plus.

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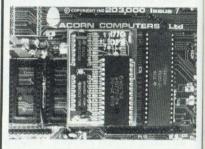
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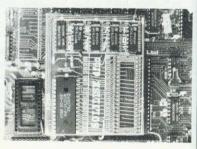
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Solidisk Technology Ltd 17 Sweyne Avenue, Southend SS2 6JQ

ichesters from Solidisk

he Solidisk Winchesters are now available for the BBC Model B, B Plus and the new Master Series machines. They are supplied with the Solidisk DFS+ADFS ROM set, available in two 16K or one 32K ROM.

WINCHESTER FOR SINGLE USERS

The Solidisk ADFS can handle one or two Winchester drives plus one or two floppy disc drives. Files on any drive can be up to the drive size in length. Up to 10 files can be open at the same time and unlimited numbers can be organised in a multi-level catalogue. Files can grow in place without risk of "Can't extend".

The ADFS allows the Winchester to be "partitioned" into multiple user areas, accessed by CP/M (Z80), Panos (32016) as well as 6502 ADFS. The Acorn Z80 Second Processor as supplied requires a new BIOS ROM to run CP/M.

WINCHESTERS FOR SMALL NETWORKS

Solidisk will soon introduce the NET-DISC Filing System (NDFS). This, although using the standard ECONET hardware, implements a direct link between any workstation and the Winchester disc drive on station 254. No dedicated file server machine (nor any Second Processor to run the File Server software) is needed.

The NDFS will also be suitable to network 32016 and Z80 Second Processors. The cost saving is substantial, especially for small networks. For example, four workstations sharing one Winchester via such a network is cheaper than four stand-alone machines equipped with local floppy disc drives.

WINCHESTERS FOR LEVEL 2 FILE SERVERS

The Solidisk Winchester Disc Filing System (WDFS) ROM enables the Acorn File Server (Level 2) to use the Winchester in place of floppy disc drives. This will improve both speed and capacity. The WDFS will work with either the 8271 or the 1770 Disc Interfaces.

HIGHER CAPACITY, RELIABILITY AND SPEED

The Winchester drives have much higher capacity than floppy discs, measured in Megabytes instead of Kilobytes. The disc is protected from dirt by a sealed casing, and has a much higher inherent reliability. The disc rotates continuously at high speed (3600rpm) enabling data to be transferred 20 times as fast as floppy discs.

HARDWARE REQUIREMENTS

To use a Solidisk Winchester, you will need a 1770 Disc Interface (Acorn or Solidisk). Master and BBC B Plus machines have this as standard. If your BBC B has no disc interface, we recommend the Solidisk 1770 Disc Interface. If you already have the 8271 Disc Interface, we recommend the Solidisk 8271+1770 Disc Interface. The Winchester drive is connected to the 1MHz bus socket.

5.25 inch WINCHESTERS

These drives (10, 20 and 40 Megabytes formatted) are of established design, with low noise and power consumption and have the same "form factor" as a half-height floppy drive.

3.5 inch WINCHESTERS

These are of the latest technology, with even lower noise and power consumption in a smaller package, and have the same "form factor" as a 3.5 inch floppy drive.

BEEB-POWERED OR MAINS-POWERED

The Beeb-powered Winchesters are only suitable for use with machines fitted with the shiny, switched mode power supply and all Master series. The Winchester power lead will also support a floppy disc drive. In other cases, a mains-powered Winchester should be specified.

THE SOLIDISK WINCHESTER RANGE

Each Winchester drive comes with:

- Integral power and data leads.
- DFS (or WDFS on request) and ADFS ROM set.
- One utility diskette in 5.25 inch, 80-track double-sided ADFS format.
- Manuals covering the above hardware and software.
- One year guarantee.

The Solidisk Winchesters are available in the following packages:

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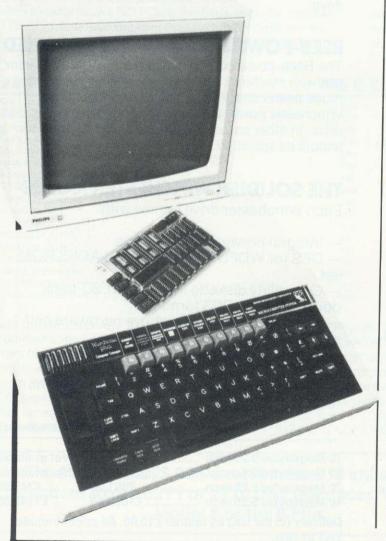
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SOLIDISKMEMORY UPGRADES

Solidisk memory upgrades for the BBC Model B offer excellent value for money. Their designs stand our for compatibility, speed, versatility and computing power. They use the latest component technology to achieve the lowest possible power consumption and size at low cost.

External ROM Cartridge

This comprises an adaptor which plugs into any ROM socket, and a blank cartridge which will accept one or two ROMs. These may be of 16K, 32K or 64K, depending on the capacity of the ROM socket holding the adaptor. This system is particularly useful for seldomly used ROMs, which are well protected by the cartridges. They can be installed and removed repeatedly without any risk to the ROMs and are compatible with Acorn cartridges.



Fourmeg CPU and ROM Expansion

The Fourmeg board plugs into the 6502 Processor socket, and two additional connections are made by sprung clips. It also provides one 64K and three 32K additional ROM sockets.

By adding faster memory and a 4MHz Processor, the board enables the BBC to run most programs in hall the time. The new Processor is equivalent to that use on the Acorn TURBO board. It will run most Master software such as the new BASIC 4 and at twice the speed.

A switch selects between normal (2MHz) and fast (4MHz) speed. The higher speed is available to all ROMs and RAM installed in the Fourmeg board. The rest of the machine is unaffected.

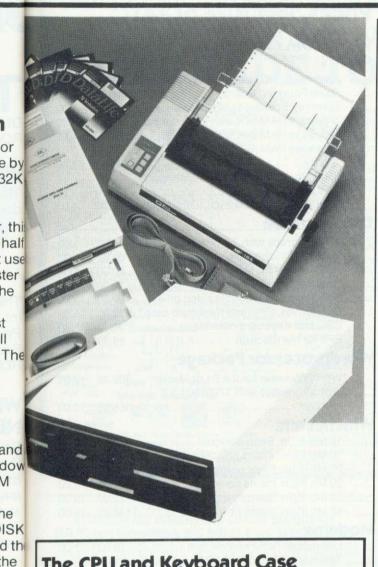
Fourmeg Board with 32K RAM

This comprises a Fourmeg board with 32K RAM and 16K MANAGER ROM. This extra RAM gives Shadov RAM and Sideways RAM capability. Shadow RAM supports the screen in any mode, leaving all the machine RAM free. Sideways RAM can contain the images of two Sideways ROMs or used as RAMDISK or printer buffer. Shadow and Sideways RAM, and the four additional ROM sockets can be switched to the fast 4MHz speed.

32K, 64K and 128K Sideways RAMS

These are the most popular add-ons for the BBC Model B. You can start with 32K and upgrade later to 64K, 128K (and even 256K). The 64K and 128K RAM boards have two 32K additional ROM sockets.

Solidisk Sideways RAM boards are compatible with most add-ons except ROM boards — which they replace. Sideways RAM can run almost all software that is normally available in ROM. Solidisk has a larg library of application programs. These include Word processor, Spelling Checker, Database, Spreadshee Extended Basic, Sprites, Ramdisc, Printed Buffer, Machine Code Monitor etc. and more than 70 computer games especially written for Sideways RAM. The programs are available in three packs, eac of 5 discs, in 40 or 80-track formats. Pack 1 is include with all Sideways RAM board. Packs 2 and 3 cost £10.00 each (£1.00 p&p). Pack 3 consists entirely of games and game design tools.



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The CPU and Keyboard Case

This compact steel case can hold a BBC and two 5.25 inch half-height floppy disc drives. The keyboard is housed in a separate case connected by a 24 inch lead. With the monitor on top, it improves your viewing angle and leaves your desk uncluttered.



The 256K Board

This has 256K of RAM, four ROM sockets, a 4MHz Processor, a 32K Manager ROM, together with WORDWISE PLUS — the best selling Wordprocessor from Computer Concepts.

The 256K RAM can be used as Shadow RAM, Sideways RAM and RAMDISK, or any combination of the three.

Real Time Clock and Solidesk

The Real Time Clock (RTC) is battery powered, giving accurate time and date. The "SOLIDESK" ROM uses the 50 bytes of battery backed RAM in the RTC chip to custom-configure the BBC computer on start-up — just like the new Master Machine. It also presents a friendly ICON/MOUSE environment — with calculator, memo and a number of disc operating system commands (DFS and ADFS). An AMX Mouse or a Marconi Tracker Ball is preferred as the input device, but the keyboard may also be used.

Floppy Disc Drives

Solidisk floppy disc drives are 80-track, doublesided, 5.25 inch, with a capacity of 640K in ADFS or Solidisk double density DFS. They are Beebpowered, supplied cased, with power and data leads, and a software pack of 5 diskettes.

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The Linemaster ROM

he Solidisk Linemaster ROM allows the BBC micro to communicate with other computers. In addition to the standard Terminal and Prestel modes, it has Viewdata Host Mode and the ability to autodial and autoanswer, all controlled by software.

Telecom Gold

Telecom Gold is the British Telecom electronic Mail Service enabling computer users to send and receive messages, telexes and to access many large databases. The Linemaster ROM allows you to use the BBC computer to communicate with Telecom Gold and Bulletin Boards. Its features include various baud rates and protocols, an elapsed time clock and 40/80 column screen display.

Prestel

Prestel i the British Telecom Viewdata service. The Linemaster ROM offers extensive facilities to communicate with Prestel. If you have an autodialling Modem, a simple command such as *PRESTEL 618 (for London) can put you "online" with the local Prestel computer.

Viewdata Host

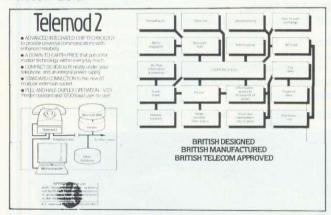
In this mode, your BBC is set up as 'Prestel look alike'. Other users can communicate with your computer exactly as with Prestel. They can browse through pages that you create using Linemaster.

Modems

The Linemaster ROM works well with all RS423 type modems, eg Telemod, Nightingale, Miracle etc. but not all modems support all the features of the Linemaster.

Telemod 2 Modem

The Telemod 2 is a high quality, mains powered, BABT approved MODEM for direct connect. This means that there are no rubber cups to fit the telephone into, but just a connection to a modern socket, with the telephone plugging into the back of the modem. The modem supports 1200/75 baud (V23) communications protocol as in Prestel and Telecom Gold.



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35K Operating system + Terminal software
16K Basic 16K Viewsheet
16K Text Editor 16K DFS (B + Compatable)
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3 Internal ROM sockets 2 External cartridge rom sockets Real-time clock with battery back-up 20 Key numeric pad

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BBC Master 128	£435.00
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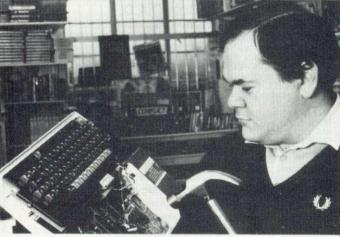
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ADJ22	Ref. Manual Part I	£14.50 (c)
ADJ23	Ref. Manual Part II	£14.50 (c)
ADJ24	Advanced Ref. Manual	£19.50 (c)
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Acorn Cambridge Co-processor combines with the BBC micro to provide full 32 bit processing. The National Semiconductor 32016 processor performs all language and application processing, the NS32081 floating point processor maximises the performance and provides support for IEEE standard fp handling.

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This processor converts your BBC into a power CP/M system and make it capable of operating in almost any CP/M format. Full details on page 5.
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TORCH Z80 2nd PROCESSOR

ZEP100: This Z80 processor with 64K fits internally in the BBC computer and has the operating system in a ROM. It is supplied with the PERFECT suite of software comprising of a database, wordprocessor and a spreadsheet and a BBC BASIC for Z80.

TZDP240: ZEP100 with TECHNOMATIC PD800P dual drive with built in monitor

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Light to the software upgrade for Bitstick I to II

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Bitstick Multiplotter Driver (most popular plotters included)
Epson FX80 Screen dump routine for Bitstick I
Epson FX80 dump for Bitstick II
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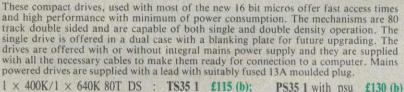
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A free pack of every PD800P. A free pack of 3M 747 80T DSDD Lifetime warranty discs with



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TS400

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All drives listed above are fully compatible with single and double density DFSs. The larger capacity referred to above is for the Acorn's ADFS system.

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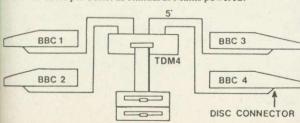
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TDM4 Quad Unit (up to 4 computers) TDM2 Dual Unit (2 computers)

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casings painted in BBC beige colour and are built to the same exacting standards as PD800P drives. The drives are fitted with

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These drives are fitted with the new model MITSUBISHI

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1 × 400K/1 × 640K 40/80T DS

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EPSON LX-80 NLQ: A new low-cost high performance dot matrix printer from Epson. Its many features include Near Letter Quality, Draft mode, programmable characters, a variety of print styles, graphics etc. Supplied with friction feed as standard 100cps.

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FX85 (80 col)......£315 (a) FX105 (136 col).....£449 (a)

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A set of economically priced printers that offers full EPSON compatibility and the near letter quality option and a facility to install 8K additional ram or

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The most versatile NLQ rom for the BBC Micro.

DOT PRINT PLUS not only gives you the 10 character pitch at 6 lines/in with underlined and double width characters as required but unlike all other NLO roms, it offers a lot more.

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MICROSPACING for professional justification in VIEW <u>and</u> — with discs — in WORDWISE/PLUS.

true BOLD PRINT in addition to double width.

12 char pitch as standard — providing 96 CHARACTERS PER LINE on the FX/RX 80 for example.

simple control codes allow VARIABLE PITCH LINE SPACING in 1/72" increments and VARIABLE PITCH from 12 cpi in increments of

1/240". (10 cpi can be selected by a single control code).

In short this one rom not only will provide professional NLQ facilities, but also a view printer driver and a font designer/editor for only £28 (d)

EPSON HI-80 PLOTTER

EPSON technology has once again scored a first by introducing a sophisticated A4 size plotter that does not need specialised software or programming skills to operate it and yet keep the cost within the reaches of all computer users. Features include 4 pens at a time - upto 10 colours to choose from, a variety of pen nibs, high speed plotting. Powerful software command codes include single commands to plot circles, ellipses or triangles. Line or bar graphs and pie charts can be plotted in a variety of exciting styles very simply by keying in the data into the computer. Epson HI-80 Plotter £325 (a)



Detailed leaflet on request.

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CENTRONICS GLP PRINTER

A NLQ printer at an affordable price. Fully compatible with Epson control codes offering a variety of fonts including super and subscripts, and a variety of graphic modes. Serial and parallel interfaces fitted as standard. Friction feed as standard. £109 (b) Tractor feed £14 (d)

PRINTER BUFFER & SHARERS

BUFFALO 32K Buffer for EPSON PRINTERS: This compact 32K buffer can be fitted internally on most EPSON printers within a few minutes. It does not require external power or any modification to the printer. It will hold about 15 A4 pages of text freeing your computer for other jobs in a fraction of the time it would normally have to wait for the printer to finish all that printing. Supplied with full fitting instructions. Buffalo 32K Buffer

PRINTER SHARER/BUFFER: A unique sharer/buffer that provides a simple solution to improve system utilisation. It can be connected to up to three computers and it will automatically switch between the computers to scan for data — no manual switching required. High speed data input rate to the buffer cuts down the normal waiting time for the computers for the printing operation to complete and thus allowing the computers to be used for other uses. The 64K buffer would hold over 30 A4 pages of text.

Facilities include: COPY, PAUSE AND RESET. LED indication for percentage of memory available and data source. Mains powered. Send for detailed specification.

Available in 64K and 256K versions

TSB 64 £199 (b)

TSB 256 £275 (b)

A Serial Buffer/Sharer will soon be available. Please send for details.

PERIPHERAL & COMPUTER SHARERS

An extended range of peripheral sharers to allow the user to switch between computers, printers and modems. High quality switching mechanisms housed in fully shielded metal cases ensure reliability. No external power input

All lines on the sharers are fully switched (36 on parallel and 25 on serial)

	Parallel	Serial
3 Computers to a Printer	36V36-3 £69 (c)	25V25-3 £64 (c)
4 Computers to a Printer	36V36-4 £85 (c)	25V25-4 £74 (c)
2 Computers/2 Printers x-over	36V36-X £69 (c)	25V25-X £69 (c)
BBC Cable Set 3 to 1 (1m ea.)	£32 (c)	£34 (c)
BBC Cable Set 4 to 1 (1m ea.)	£39 (c)	£41 (c)

Computer Sharer:

computer to 2 printers fitted with Cable for BBC TCS26 £19.50 (c)

PRINTER ACCESSORIES

EPSON ACCESSORIES: Interfaces: 8143 RS232£28 (d) 8148 + RS232 + 8K£75 (d) 8177P NLQ for FX80 + /FX100 +	8132 Apple II£60 (d)
Parallel & Serial Buffers of various size	also available.
FX80/80 + /85 Tractor Attachment FX80/80 + Paper Roll Holder LX80 Tractor Feed	£37 (c) £17 (c) £20 (c)
SHEET FEEDERS: 8338 LX80£49 (b) 8333 FX100 + /105£169 (a)	8331 FX80 + /85
RX/FX80/80+, FX85	Ribbons: RX/FX100/100+, FX105£10 (d) £7.50 (d)
Dust Covers: £5.50 (d) FX80	

	CESSORIES		mailir
1000 C	TAXAN CANON Accessories: RS232 + 2K buffer£78 (d)	Ribbon£6 (d)	form alphal
	JUKI 6100 RS232 Interface £65 (d) Tractor Feed £129 (a) Ribbon (Carbon) £2.00 (d)	Spare Daisy Wheel£14 (d) Sheet Feeder£182 (a)	DBA9
	BROTHER HR15 Daisy Wheel	Sheet Feeder£182 (d) Keyboard£135 (a)	limitle prepa on-dis through
	Printer Leads: BBC Parallel Lead (1.2m)£6 (d) Other lengths can be supplied on order. IBM Parallel Lead (2m)		calcul may comm having variet
	PAPER & LABELS Plain Fanfold paper with micro perfora 2000 sheets $9\frac{1}{2}$ " × 11 "	ations: £13 (b)	accou mailin and po
	Labels/1000: Single Row $3\frac{1}{2}$ " × 1 7/16"£5.25 (d)	Triple Row 2 7/16" × 1 7/16".£5 (d)	busine or ne

MULTIFORM Z80

The MULTIFORM Z80 2nd Processor for the BBC Micro opens the horizons of CP/M software to the BBC micro user

- Will enable running of almost any CP/M applications
- Will enable transfer of data between different disc formats
- Emulates the two terminals most frequently used by CP/M software

MULTIFORM Z80 interfaces directly to a normal BBC micro requiring no hardware changes. It is supplied with OS/M operating system in rom which can run all software that obeys CP/M 2.2 constraints and its configuration is not hardware specific.

MULTIFORM Z80 is truly flexible and can be used with any BBC micro drive system, single or dual drive, 40 or 80 track format and single or double sided. Unlike other currently available Z80 processors for the BBC micro, there are absolutely no restrictions on the type of drive that can be used with the MULTIFORM Z80.

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MULTIFORM Z80 plugs into the 1MHz bus connector of the BBC micro. It is mains powered and does not put any extra load on the BBC's psu. The data cable can be several feet in length, allowing convenient siting of the MULTIFORM Z80, unlike present second processors, which have 8" cables.

The formats supplied include: Acorn Z80, RML 380Z and 480Z, Torch (read only), Osborne, Televideo ... we also offer to configure other formats at an extra charge."

Rom based OS/M operating system is fully compatible with Acorn's single and double density disc interfaces. Installing the OS in rom allows more space on discs for programs and data and response to system commands is very fast. (Note: Single density DFS will only read/write to single density CP/M formats).

MULTIFORM Z80 can format, read or write from a very wide range of CP/M disc formats. On a dual drive system. he drives can be set up independently to run two different formats at the same time. This will enable:

The user to buy software from a very wide range of suppliers without having to worry about the type of format supplied.

- Interchange of valuable data and files among users of various CP/M computers.
- Using a system at home for preparing data required in the
- Software writers/developers to write software in any one format and transfer it to any other format without having to pay for expensive porting charges.

MULTIFORM Z80 is supplied with a library of a number of popular CP/M formats and a utility disc containing a program for creating files for the additional formats. Each library can load 32 formats and there are no restrictions on the number of librarires that can be created.

The utility disc also contains a program to interconvert ASCII texts wordprocessed on a normal BBC and under OS/M or CP/M.

MULTIFORM Z80's terminal emulation includes the ADM-3A, the HAZELTINE 1500 and the BBC making the installation of most of the well known CP/M software easy.

MULTIFORM Z80 converts your BBC computer into an almost universal CP/M machine and adds the power of being able to run two different formats simultaneously, which currently is possile on only the very sophisticated specialist machines.

For any one working or intending to work in a CP/M environment, MULTIFORM Z80 is an indispensable tool.

In offices where there are a multitude of CP/M machines and a few BBCs, MULTIFORM Z80 will prove to be invaluable for transferring data between the various CP/M machines.

MULTIFORM Z80 (including utility disc, library disc and manual) £299 + £4 p&p

(When ordering please specify the type of DFS, MULTIFORM Z80 will be used with)

SPECIAL MULTIFORM UTILITY to read and write to IBM PC Disc. 575 (d)

CP/M SOFTWARE FOR TORCH & ACORN Z80 PROCESSORS

We can now supply almost any CP/M based software package in a format suitable for the Torch Z80 and Acorn Z80 second format suitable for the Torch Z80 and Acorn Z80 second processors. Phone for details on prices for popular packages for IBM

Please phone for our new professional software catalogue

WORDSTAR PROFESSIONAL The advanced word processing package comprising of WordStar, MailMerge, StarIndex and SpellStar, a total combination offering substantial savings on individual prices. WordStar is the best selling word processing rogram on the market. Extensive operator aids include a comprehensive friendly manual, step-by-step training guide, command cards, on-screen menus. Spellstar checks text files against to 20,000 word-plus dictionary. You can both add to the dictionary and create specific supplementary ones. Mailmerge is ideal for mailing applications. It enables the fast production of personalised letters, mailing labels, invoices, etc. StarIndex creates alphabetical indexes, tables of contents, paragraph numbering etc.

WORDSTAR PROFESSIONAL £310 (a) WORDSTAR £275 (a) WORDSTAR Upgrade to W/S Prof £195 (a)

DBASE-II Undoubtedly 'The Database', can be used for an almost mitless number of business applications, ranging from mailing list preparation through to running accounting ledgers and payrolls. An on-disc tutorial takes you from setting up a simple file all the way through to setting up custom screens and reports. Automatic alculations may be performed on data. Fields or entire databases may be modified or replaced with single, English-like basic commands; Dbase-II can therefore be used by general personnel naving no programming knowledge. It can be tailored to suit a of professions and individual needs, with files such as accounting, payroll, time billing, job costing, scheduling and mailing lists. It can access several files at a time. It is fast, flexible and powerful.

SAGE ACCOUNTS: This package has been designed for the smaller business, for the user who is unfamiliar with computers but wanting needing to computerise the bookkeeping and accounting

functions. Sage is easy-to-learn and easy-to-use and is complete with a full tutorial booklet and a free manufacturers 90-day 'Hot-Line' support. It is a truly integrated package (all on one disc!) and covers Sales, Purchase & Nominal Ledgers, with a capability of handling up to 9999 accounts per ledger. It will handle all your Sales and Purchase invoices and can easily generate account & management reports. £375 Sage plus (£695) for the larger business, and Sage Payroll (£195)

Other packages available include PRO-PASCAL, CIS-COBOL, Supercalc II, MACRO-80 etc. Please telephone with your requirements.

A.T.I. Trainers — these superb interactive training discs simulate the package being studied. A unique screen technique provides a friendly interaction — in the upper area, a faithful reproduction of the screen is displayed, while at the bottom, a series of prompts and explanations lead the student through the exercise. ATI trainers available include Wordstar, dBase-II, dBase-III, Multimate, Multiplan, Word at £75 (b). Please phone for other trainers.

TORCH GRADUATE IBM SOFTWARE: We are able to supply most popular software packages including: WORDSTAR, WORD, EASY-WRITER, DBase-II & III, LOTUS-123, VISICALC, SAGE etc. Please telephone with your requirements.

PROFESSIONAL SOFTWARE PUBLICATIONS

	and the same		
Wordstar made easy	£16.95 (c)	Multimate Complete	
Introduction to		Guide	£16.95 (c)
Wordstar	£17.95 (c)	ABC of LOTUS 123	£15.95 (c)
Wordstar Handbook	£11.95 (c)	The RS232 Solution	£17.95 (c)
dBase-II for the first		CP/M Bible	£15.95 (c)
time user	£16.95 (c)	Soul of CP/M	£14.95 (c)
Understanding		CP/M Handbook	£14.95 (c)
dBase-II	£22.95 (c)	Mastering the	
Understanding		CP/M	£17.95 (c)
dBase-III	£22.95 (c)		
Multiplan Made Easy	£18.95 (c)	(no VAT	on books)

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COLOUR MONITORS

RGB MONITORS	(all	monitors supplied with a BBC l	ead)
1431 14" RGB Std	Res	452 × 585 pixels	£179

1451 14" RGB Med Res 653 × 585 pixels £229 (a) 1441 14" RGB Hi Res 895 × 585 pixels £375 (a)

MICROVITEC 14" RGB/PAL/Audio

1431AP 14" Std Res 452 × 585 pixels £199 (a) 1451AP 14" Std Res 653 × 585 pixels £275 (a)

The above monitors are available in plastic or metal case.

MICROVITEC 20" RGB/PAL/Audio

2030CS 20" Std Res £380 (a) 2040CS 20" Hi Res £685

TAXAN 12" RGB:

Super Vision III with amber/green option £345 (a)

MITSUBISHI XC1404 14" Med Res RGB:

BBC/IBM Compatible. A new monitor with etched dark screen with both brilliance and contrast controls giving sharp graphics and text display. £249 (a)

TOUCHTEC-501

Designed for use with Microvitec metal cased monitors, and using the RS-423 socket, this unit brings genuine touch-screen operation to your BBC. Ideal for the educational market. Supplied with a users handbook and utilities disc containing starter programs and development software.

Touchtec 501

£260 (b)

EPROMER II



A sophisticated eprom programmer that handles the full range of popular single rail eproms (incl 27256) and allows the user full control of the programming process.

Its powerful menu driven software makes the programming of eproms simple, efficient and eliminates the need to have fiddly switches for selecting eprom types, programming voltage or method. The features include:

* Integral power supply ensures no power drain from the computer.

* Interfaces through 1 MHz bus, fully buffered.

- * Clear and simple instructions displayed on the screen make the programming easy for both the first time user and the advanced user.
- * Eproms upto 16K (27128) programmed in single pass (27256 in two passes).
- * Selectable programming voltage 25/21/12.5V
- * Selectable programming method normal or high speed algorithmic. High speed programming enables 27128 to be programmed in just over 2 mins. Normal programming skips addresses with FF data to increase programming speed. Automatic verification on completion of programming.
- * User can select any section of the eprom from a single byte to its full address range to Blank Check/Read/Program/Verify enabling program development/changes very simple.
- * Full screen editor with HEX/ASCII input.
- * Data input from keyboard/Tape/Disc/Eprom.
- * Software interface for integration of user's special requirements.
- * Constant display of all options selected.

UV1B as above but without the timer.

- * Several BBC BASIC programs can be entered on a single eprom.
- * Checksum facility allows for easy identification of programmed roms.
- * Enter OS Commands from within the epromer program.

EPROMER II with Manual & Software on disc £99 (b)
ROM based software £10

UV ERASERS

UV1T Eraser with built-in timer and mains indicator. Built-in safety interlock to avoid accidental exposure to the harmful UV rays. It can handle up to 5 eproms at a time with an average erasing time of about 20 mins.

£59 (b) £47 (b)

MONOCHROME MONITORS

KAGA	
KX1201G 12" HI-RES green etched screen	£90 (a)
KX1203A 12" HI-RES amber etched screen	£105 (a)
PHILIPS	
BM7502 12" HI-RES green screen	£75 (a)
BM7522 12" HI-RES amber screen	£79 (a)

MONITOR ACCESSORIES

Microvitec Swivel Base (14" plastic monitors) Taxan Swivel Base for mono monitors with integral	£20 (c)
clock	£22 (c)
Philips Swivel Base £14 (c) Monitor Plinth	£13.50 (c)
Double Tier Plinth for flat drive, computer and	
monitor	£19.50 (c)
Taxan RGB Cable £5 (d) Microvitec RGB Cable	£3.50 (d)
Monochrome RNC/PHONO Cable	£3 50 (d)

REAL-TIME CLOCK CALENDER

A low cost unit, allowing the facilities of units costing far more. Built to professional standards, it opens up the total spectrum of

Real-Time applications. Possibilities include desk diary/planner, calender, continuous display of on-screen time and date information, automatic document dating, precise timing and control in scientific applications — its uses are endless. Simply plugs into the user port — battery backup is supplied as standard. A full manual as well as extensive software



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including a simple demonstration diary/planner application program on disc. £21 (d)

ROM/RAM EXPANSION SYSTEMS

ARIES B-32 BOARD: Features 32K of RAM and a 16K ROM socket. RAM can be configured as 20K or 16K as shadow RAM and 12K or 16K or 32K sideways RAM. New commands include comprehensive sideways ROM/RAM management system, simplified direct access to screen RAM and the ability to move/swap the contents of any area of memory. ROM/RAM management system allows RAM allocation, list ROMs, load sideways RAM, disable ROMs, and extend any buffer including printer buffer.

 AIRES B32 RAM BOARD
 £79 (d)

 ARIES B12 ROM BOARD
 £40 (d)

 ARIES B12C Adaptor Board for B12
 £7.50 (d)

ATPL SIDEWISE ROM EXPANSION BOARD A well constructed expansion board, simple to instal and requires no soldering. All buses are buffered. It allows full sideways rom expansion to 16 ROMs. One socket has been split into two 8K sockets to allow the use of 8K CMOS RAM. Battery backup option allows data retention in the RAM when the computer is switched off. Several link selectable options including write protect for the RAM. ATPL Board £37 (d) Battery Backup Kit £18 (d)

ATPL Board for BBC PLUS 10×16K ROMs £29 (d)
COMPUTER VILLAGE CV-16 Rom Board £38 (d)

A neatly designed, simple to instal board allows full sideways rom expansion on the model B. Two sockets for 8K CMOS RAM allow a total of 16K for which battery back is fitted as standard. £35 (d)

RAMROM-15 The advanced sideways ROM/RAM expansion system. This is an external unit, using high quality construction, attractively packaged in a BBC coloured metal case, allowing easy access to all the sockets. No soldering is required. Allows 11/12 additional sideways ROMs to be fitted with an option of up to 16K sideways RAM. All commonly available RAM can be used i.e. 4801/6116/6264 or xx128. Battery back-up fitted as standard. For development work and further expansion, most of the 6502 processor signals are available. Supplied with utility disc and full instruction manual.

(Above boards are for use with standard BBC computer and not compatible with B plus unless specifically mentioned)

NOVACAD Computer Aided Draughting for the BBC Micro

A sophisticated CAD package with unique facilities which until now were confined to custom built CAD packages.

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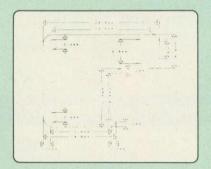
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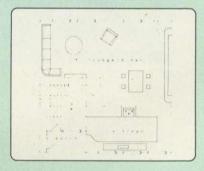
Whether you want to draw a complex electronic circuit diagram or plan your new kitchen or simply draw a cube NOVACAD will help you do it better and more easily.

All you need is a BBC micro model B fitted with Acorn DFs and a single disc drive. If you have a 6502 2nd processor and a dual disc drive NOVACAD's capabilities are further



- Very user friendly with all commands and controls from the keyboard. Special windowing techniques make available to the user almost one million dots allowing a lot more detail to be put on the drawing than one would normally expect the BBC to be capable of. The drawing can be 4 windows across and 5 up.
- Libraries of user defined ICONS such as electronic symbols can be created easily and edited even in the middle of drawing another diagram. ICON size is not limited to a number of pixels. An ICON can contain up to 500 lines, so complete drawings or sections of large drawings can be saved as ICONS for use with other drawings.
- ICONS can be called by name from a library into any part of the diagram and can be moved, enlarged, reduced, rotated in 90° steps and have mirror images made before being finally positioned.
- Shapes can be copied on the screen as many times as
- The zoom facility allows the user to magnify any section of a drawing by up to 20 times to make it easier to insert
- Horizontal and vertical displacements can be measured in any user defined scale.

- Any two colour can be used in mode 4.
- Up to '8 levels' can be used to produce multi layer drawings, and then user can decide which levels are to be displayed. This can be particularly used in pcb drawings, architectural drawings with details of the services behind the walls displayed only when required and many other such applications.
- Text can be added at any position vertically or horizontally.
- Use of 2nd processor will allow use of any 4 colours, higher pixel density drawings and considerably faster operation. (NOVACAD without the 2nd processor is faster than any other CAD package we have seen for the
- Powerful delete facilities allow deletion of single lines or whole sections with minimum of key presses.
- Printer dump for Epson compatible printers incorporated in the software which allows a full or a sectional screen dump.
- optional plotter utility contains a plotter configuration program allowing the user to configure a program for his plotter. Pre-configured programs are included for a number of popular plotters.



NOVACAD will prove to be an invaluable teaching aid in technical schools and colleges and for anyone involved in draughting it will be an ideal labour saving tool.

NOVACAD package with 16K ROM, Utility disc and a comprehensive manual £79 (c)

Novacd compatible with Tracker Ball/AMX Mouse £99 (c)

Stand Alone Mouse for use with NOVACAD £34 (d)

Upgrading of existing ROMs and DISCS £20 (d)

Plotter Utility Program £28.50 (d)

W META VERSION THREE



- Assembles for even more processors
- Now over 70k long on 2 Roms and 2 Discs
- Dozens of new options, features and directives

The Original META system sold hundreds worldwide; it's being used in Universities, Polytechnics, British Telecom, the BBC, the

Now there's an even better version. It comes on two Roms and two Discs for your BBC or BBC + (Master soon) and gives you complete Editing and Assembly facilities for all the listed processors:

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1802	68HC11	6808	
HD 64180	68000	6301	
Z80	8048 Series	6303	0.1
6502 (including all	8051 Series	6305	
CMOS varients)	8080	6801	
65C812	8085	6803	
65C816	Z8	6805	
6800	68120	6804	
6802	68121	6809	10

META uses the appropriate standard mnemonics for each, eg. LD (HL) 0ABH in Z80 and MOVE. B DO, \$\$0 (A5, D6.L) in 68000 etc.

Full nestable Macro facilities are provided, and nestable conditional Assembly, (IF/ELSE/ENDIF), Modular source code (including parameter passing). True local and global labels, 32 bit labels and arithmatic (incl. MIL, DIV, AND, OR, XOR, SHL etc). 30 ways to send object code during Assembly, including Intel Hex, S.Record, Binary etc to Disc files, RS423, EPROM emulators etc, local reassembly and over 50 directives, including DS.X, DC.X, EQUX, ECOR etc).

Incredible Wordwise-style Editor integrated in with Assembler; Search/Search-Replace, Block copy/delete, markers etc; dozens of special features and functions for Assembly code programmer. Fast

Plus special new serial Communicator Area with Complex Option

Send for your 8 page datasheet on the META Assembler and the PORTAL EPROM Emulators. Set of disassemblers and Logic Analyser coming soon. £145 (c)

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15 Burnley Road London NW10 1ED Tel: 01-208 1177 (close to Dollis Hill (

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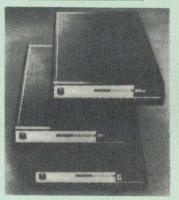
COMMUNICATIONS

MIRACLE WS3000 Range: * A new, professional series of intelligent modems with full auto dial and auto answer facilities as standard. * HAYES protocols are implemented allowing the use of a wide range of well proven communications software. 'Plain English' command structure simplifies the use of the modem even for the first time user. * All models feature a centronics compatible printer port allowing direct output to a printer. * A line sharing facility that allows WS3000 to differentiate between calls intended for data, and those for speech. * An intelligent speed buffered RS232 port and a wide range of available data rates makes this one of the most powerful multi speed range of modems available. * Line noise filtering ensures error free transmission and reception of data on long or noisy lines. * Internal battery backup allows storage of 63 names and telephone nos. * This range of modems can be factory fitted with high security data access protection system. * Models V2123 and V22 can be factory upgraded to V22bis standard giving a single compact modem capable of data rates from 75bps to 2400bps.

WS3000 V21/23: This modem complies with the CCITT V21. V23 and Bell 103 standards and operates at CCITT standards for 300bps, 75/1200bps, 1200/75bps full duplex, 600bps and 1200bps half duplex, and the Bell standard for 300bps full duplex. £295 (b)

WS3000 V22: This modem operates on all V2123 standards plus V22 standard for 1200bps full duplex V22bis standard. £495 (b)

WS3000 V22bis: This modem operates on all V21/23 and V22 standards plus 2400bps full duplex. £650 (b) APPROVED for co elecommunication systems specifie in the instructions for use subject to



BBC Data Cable for WS3000 £6 (d) Data cables for other micros available.

MINOR MIRACLES WS2000 This highly successful world standard modem, having BT approval, covering V21, V23, (BELL 103/113/108 outside the UK) and including 75,300,600, 1200 Baud ratings. What possibly gives this modem its biggest advantage is its option of computer control. A 25Way RS232 input as well as possible computer controlled auto/dial/auto-answer makes this modem unique. WS2000 £125 (c) Data Cable £7.

WS2000 Auto-Dial card: includes an integral loudspeaker for monitoring of the phone line £30 (d). BBC User Port cable (for modem control) £4 (d)

WS2000 Auto-Answer Card £30(d).

(Please note that the A/D & A/A Cards are still awaiting BABT Approval.)

SKI KIT (Allowing total control of the modem by your computer)

DS1 Disc (for Commstar): When used with the Auto-dial card, SK1 Kit, and a user port cable, this software will dial out to Prestel, enter your password etc. and leave you in Commstar. Will also store many bulletin board telephone numbers and protocols for autodialling

£10 (d)

GEC DATACHAT 1223 Modem: An economically priced BABT approved modem complying with CCITT V23 standard capable of operating at 1200/75bps and 75/1200bps and 1200/1200bps pseudo full duplex. It is line powered does not require external power source. It is supplied with software suitable for connecting to PRESTEL, Micronet 800, Telecom Gold and a host of bulletin boards.

DATA-BEEB An advanced communication ROM from Miracle Technology. Its many features include both Viewdata (Prestel) and Terminal modes, Auto-Answer and Auto-dial for fully expanded WS 2000's etc. Macro facilities allow flexible use of its many facilities e.g. automatic dialling, log-on, going to a specific page, printing it, and going off-line, all in one operation.

COMMUNICATIONS SOFTWARE

CONNECT-3000 AN ESSENTIAL UTILITY FOR THE WS3000 OWNER a dedicated control package specially written to optimise the potential of the WS3000 series of modems. It provides a friendly menu-driven 'frontend', for the superb but rather complex multitude of facilities of the 3000 no need to remember register nos. or complex command codings etc. It provides easy control for Prestel, Terminal, Auto-Answer/Dial use, while a unique 'default' facility provides automatic, pre-defined screen presentation. Works in conjunction with ALL communication software, including Commstar, Data-Beeb, Termulator, Termi, Communicator etc. £16.50 (d) 40/80 Disc

TERMULATOR An advanced terminal emulator on a 16K Rom. Emulations include VT52/100, Tektronix 4010 etc. Allows a BBC to be used as a terminal for almost any mainframe computer or computer network.

COMMUNICATOR This is a full 80 col VT100 terminal emulation program on 16K eprom. It is a more advanced program than TERMI and features easy to follow screen menus. The rate at which data is sent or received is easily set up with rates up to 19200 Baud with 80 column text. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Communicator is not suitable for PRESTEL). £49 (d) £49 (d)

RS232 Solution (Book)

£15.95 (c)

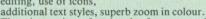
COMMSTAR An ideal communications rom for both Prestel and bulletin boards. Facilities include Xmodem, clock etc.

RS232 Solution Book

£17.95 (c)

AMX MOUSE with SUPERART

The mouse will now be available with enhanced software, the 'SUPER ART' which is compatible with 6502 2nd processor the ARIES RAM board. BBC + shadow mode, tape and ACORN DFS and ADFS. Allows full use of colour in mode 1. Disc users can create colour pictures in A4 size with dot pattern editing, use of icons,



There is a variety of optional software to make the mouse one of the most versatile peripherals that can be added to the BBC micro.

AMX Mouse with Super Art

£67 (d) £43 (d)

AMX Super Art Package on its own

AMX PAGEMAKER provides a high resolution A4 Typesetting and

Artwork system. AMX 3D ZICON will let you transform three dimensional vector data and

translate them into 3D on screen graphics. £21 (d)

AMX DATABASE is a new filing system with 1000 records per file and unlimited number of fields per record.

RB2 TRACKER BALL

A precision built tracker ball. Software allows RB2 to function instead of cursor keys, for word processing, CAD/CAM etc. Software includes a graphics/CAD package.

RB-21 (with 'icon artmaster').

MERLIN

A new advanced disc-users utility. This 16K rom-based utility is one of the most comprehensive packages offering many unique features. Its over 50 commands are all fully tube compatible. It is supported by a 100 page manual. This package is aimed primarily at disc users with the BBC B and the B plus. (Master version available soon).

Major Features:

MERLIN

DISC UTILITIES including:

Disc editor, with search, verify and repair utilities. Clone utility, backup/edit of protected discs. A special formatter to speed up disc accesses. Tape archive of discs and tape/disc transfer utilities. Screen compaction. Vastly improved copy and backup facilities.

MACHINE CODE UTILITIES including:

Memory search and edit, disassembly with 65C02 codes supported, switching between roms, main memory and tube, examine fx and osbyte calls.

Send for the detailed command listing.

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FIRMWARE AND SOFTWARE

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STARdataBASE A fast machine code, true random access database program in a 16K Eprom. Up to 4096 records in a file, up to 69 fields in a record. The record layout is totally user defined. Entirely menu driven — thus very user friendly. Extremely fast searches are possible using the Keysearch facility. Mailmerging from View and Wordwise, and address labelling.

MASTERFILE II The new version of the popular general purpose file management system allowing large amounts of information to be stored and processed. It allows up to 17 fields per record, and the only limitation as to the number of records is the capacity of the disc. This latest version features many new facilities including use with WORDWISE/VIEW £17.00 (d) Disc (80 or 40T).

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WORD-PROCESSORS

VIEW Acorn's version V2.1 word processor rom. £39 (c)

VIEW VERSION V3.0 Also compatible with BBC + Complete with Printer Driver Generator. £60 (c)

HI VIEW Disc based version of VIEW word processor for use with the 6502 2nd processor. Allows 47K of user memory. £36 (c)

VIEW INDEX Disc based program to create an index from VIEW text files. Ideal for anyone concerned with writing extensive reports or books.

VIEW PRINTER DRIVER GENERATOR: This driver generator will enable you to produce a driver to suit your printer and also let you view the text as it will appear on the paper including condensed, italics, sub and super script modes.

£8 (d)

VIEWSPELL: A rom based spelling checking utility with a dictionary of 70,000 words on disc. Additional/specialised dictionaries can be created. Facility to search the dictionary for words beginning with or ending with certain characters. £52 (d)

WORDWISE PLUS The new advanced Wordwise on a 16K eprom, for the more specialised users who require added features and flexibility. Four new programs are also supplied allowing mailmerging, index generating, two-column text printout and continuous processing.

£45 (d)

WORDEASE A rom based utility for the Wordwise plus. £24.50 (d)

SPELLCHECK III A 16K rom based program for View and Wordwise plus. Contains 2000 words on the rom and 6000 (expandable to 17000) on disc.

EDWORD II £43 (a)

SPREADSHEETS

VIEWSHEET Acorn's spreadsheet provides 255 columns and 255 tows and will operate in any mode. Windows can be created which can then be rearranged to provide any print format required. Function keys provide for easy entry of commands. Printer control codes can be used using the printer driver. Fully compatible with VIEW and the 6502 2nd Processor.

VIEWPLOT: A disc based Linear graph/barchart/piechart plotting program. £25 (d)

INTERSHEET The new spreadsheet from Computer Concepts. Many advanced facilities including 105 character display, several spreadsheets may be used at once, may be used with View & Wordwise etc. etc.

INTERCHART Graphics Package for the Intersheet. £30 (d)

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LANGUAGES

META-ASSEMBLER: For full details please see page 6 of this advertisement.

Meta-Assembler £145 (c)

ACORN P-SYSTEM A portable operating system supplied complete with USCD PASCAL and FORTRAN 77. £259 (b)

6502 DEVELOPMENT PACKAGE A Macro-Assembler with utilities for use with the 6502 2nd Processor. Enables the serious programmer to develop large programs in assembly language.

ACORN MICRO-PROLOG: The logic programming language seen as the language for programming in the future and used extensively in the artificial intelligence field. A simple 'front end' is supplied to make syntax more user friendly for new users. 16K Rom, manual and extension modules.

ISO-PASCAL Acorn's full implementation of International Standard Pascal on two 16K ROMs. Disc Version for use on 6502 2nd Processor also supplied. Comprehensive manual. £48 (a)

ISO PASCAL Stand ALONE GENERATOR: Utility to convert programs produced using ISO PASCAL for stand alone applications.

ACORN LOGO A full implementation of the Logo language from Acornsoft. Supplied as two ROMs with a tutorial course and technical manual.

£49 (b)

LOGOTRON logo

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BCPL A full implementation of the BCPL compiler language consisting of the language of ROM, disc containing the BCPL compiler, a screen editor, a 6502 assembler, other utilities and programming aids and examples of BCPL code and a 450 page manual.

£46 (b)

BCPL CALCULATIONS PACKAGE Supplied on disc, it supports floating point, fixed point and fast integer calculations. It includes the BCPL calcultion files, example files and a comprehensive user guide.

£17.30 (d)

BCPL STAND ALONE GENERATOR

£39 (d)

Acorn LISP Rom, Acorn FORTH Rom, Acorn COMAL, (each) £39 (d)

MICROTEXT A frame based authoring system from National Physical Laboratory for interactive computer tutoring. Disc based.

Disc £49 (c)

G:FORTH An advanced implementation of FORTH which follows the 79-Standard specification on a 16K ROM and has a full double number extension set.

£39 (d)

OXFORD PASCAL A fast, compact P-Code compiler, that fully utilises BBC Graphics and sound, contains a powerful editor, and produces 'standalone' software. (Specify 40/80T) £35 (c)

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DATABLED£24 (d)	COMMUNICATOR£49 (d)
CUMMSTAK£26 (d)	TERMULATOR£25 (d)

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No VAT on books; Carriage (c)

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8086 Book	£23.95
Advanced Z80 M/C Prog	
Programming the 8086/88	£16.95
Programming the 6809	£15.95
Programming the Z80	£19.95
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Intro to Wordstar	
Wordstar Handbook	
dBase II for the 1st Time User	
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Understanding dRase III	

Multiplan Made Easy. £18.95 Multimate Complete Guide. £16.95 ABC of LOTUS 123. £15.95 The RS232 Solutions. £17.95

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(c) £1.50 (d) £1.00.

EDUCATIONAL SOFTWARE

We are pleased to announce that we now stock the full range of BBC Publications Educational software for the BBC computers. This software which is in many cases developed alongside radio and TV programs from the BBC Education Department, has all been tested in many schools, and by education experts to ensure the high quality one would normally expect from BBC. These packages supplement the class room learning by providing moving and colourful graphical displays which normally cannot be easily produced on the blackboard and help in ensuring clear understanding of a variety of subjects. The software has received wide acclaim from teachers, and in the educational press. All cassette programs transfer easily to disc, and all disc programs can be run on 40 or 80 track drives.

PRIMARY LEARNING

Asimed at the 9-12 age group, programs include Phases of the Moon, Eclipses, Seasons of the Year, Planetary Motions and Lander which is a gravitationally accurate game. All programs feature colour graphics

COMPUTERS AT WORK: THE WORK GAME

Uses the technique of computer synchronised audio to illuminate two of the most important applications of computers — robotics and information technology. Includes a complete database program, tutorial on word processing principles, and robot control program driven by a logo-type language. [EC £13 (d)

↑ [8] EC £17(c)

DRAWSTICK

For children aged 8 upwards allowing them to create pictures, charts, maps and diagrams. It is sufficiently sophisticated for use by older children and adults. Pictures are saved in a compressed form, and can be incorporated in your own programs. Uses keyboard or joystick.

INTRODUCING GEOGRAPHY

Four exciting graphic adventure simulations to bring geography to life for the 9-13 age group. River involves navigating a river's course to the sea. In Flight, you fly an aircraft round the world. Summit takes you up Mount Everest, and Nomad involves survival in the desert.

MATHS WITH A STORY 1

Four primary-level maths programs suitable for children of a wide range of abilities. Topics include symmetry, co-ordinates, and probability.

MATHS WITH A STORY 2
These further four maths programs are for the same age/ability range as pack 1, and cover similar topics, from different angles.

£9.50 (d)

NUMBER GAMES

Six maths programs designed to please the eye and stimulate the mind of any active and adventurous child aged 8 upwards.

USING YOUR COMPUTER
A friendly and original introduction to computers using the computer synchronised audio technique. Written for a 8-12 year old but also suitable for any complete novice. Total of 80 minutes of audio material and 14 programs.

£26.00 (c)

An elegant but simple program to introduce primary school age children to the concept of word processing. Search, delete, justify etc have small animal icons associated with them. Fun manual for small children.

£10.75 (d)

SECONDARY LEARNING

ADVANCED LEVEL STUDIES: STATÍSTICS

Six programs covering the central concepts and principles of statistics. Topics covered are Discrete Data and Binomial Distribution, Continuous Data and the Normal Distribution, Hypothesis testing and confidence intervals, Central Limit theorem and Estimation, Simulations, Correlation and regression.

ADVANCED STUDIES: GEOGRAPHY
Four programs examining aspects of social geography — traffic and town planning, drainage basin management and planning for industry. Users can alter the models. Details in the comprehensive manual.

[8] £11 (d)

INSIDE INFORMATION

Designed to provide a basic introduciton to information technology for young people and adults. The course assumes no prior knowledge of the subject and is suitable for use in secondary schools, further education colleges, ITeCs and adult education centre. This software can be used alone, or in conjunction with the BBC's Inside Information radio series.

FCEII(d)

Developed by the Open University to provide a full implementation of Logo—the language of learning—for the BBC Micro. 2 × 16K ROMS and two detailed manuals (120pp and 300pp)

SCIENCE TOPICS: WAVES

A secondary level physics program allowing the student to learn about waves by displaying waveforms on screen. Parameters can be altered and the results observed immediately.

[F] £15 (d)

SCIENCE TOPICS: RELATIONSHIPS

A secondary level biology program giving a sophisticated simulation exercise for students, based on data from the World Health Organisation. You are malaria control officer for an African village, and you must use the right combination of drugs, pesticide and education to combat the disease.

[£15 (d)

SCIENCE TOPICS: BONDING

A secondary level chemistry program designed to reinforce and strengthen students' concept of the bonding of elements. Transfer and sharing of electrons are both shown graphically. [8] £15 (d)

SCIENCE TOPICS: ELECTROMAGNETIC SPECTRUM

A secondary level graphical adventure designed to test your knowledge of the electromagnetic spectrum. You are lost in space, and you must build a radio, perform spectroscopic analysis etc. to complete the adventure.

四 £15 (d)

A secondary level program about using computers for control. The pack gives three simulations of control systems. Control is achieved using a subset of 6502 assembly language. A program editor is supplied.

SCIENCE TOPICS: NEWTON AND THE SHUTTLE

This secondary level interactive program in three parts follows the space shuttle from launch to recapture of a satellite in space. Students knowledge of Newtonian mechanics is tested at each stage.

SCIENCE TOPICS: ECOLOGY

This program allows students to take the part of groups who manage a nature reserve according to their own special interests. The object is to keep all groups satisfied.

SCIENCE TOPICS: POLYMERS

Students run a manufacturing company and must make decisions as to the best materials to use for their products. They compete with a computer run rival company. Two areas of manufacturing are featured — car parts and

SECONDARY SCIENCE: MICROTECHNOLOGY

This software for the 14-16 age group will help students understand certain fundamental concepts in basic electronics. The pack contains Logic and Resistor Tutors, a Servo circuit simulation and a Circuit Design program.

SECONDARY SCIENCE: THE MOLE CONCEPT

A computer synchronised audio program which explains definitions of atomic and molecular masses and attractively depicts molar equations. The audio track is written and presented by Fred Harris.

© EC£17 (c) EC£13 (d)

SECONDARY SCIENCE: UNIFORMLY ACCELERATED MOTION

A physics program which illustrates basic equations, uniform acceleration under gravity and the idea of terminal velocity. The medium is computer synchronised audio. ~ E EC£ 17 (c) □ EC£13 (d)

The popular 'sight and sound' touch-typing tutor using colour graphics. The layout and parameters can be altered. 23 exercises can be loaded from disc.

GENERAL

GAME CORE

This software gives you all the information and intelligence routines you need to write simple and highly absorbing board games for your computer.

A professional tool for mahcine-code programmers, suitable for assembly language experts and beginners alike. It is also ideal for teaching assembly

25 programming aids for the BBC Model B. Book (essential) sold separately. Program include machine code monitor, disassembler, fast flood fill, sprite generator/mover, and many more.

ULTRACALC 2 An electronic spreadsheet program with all the necessary built-in features. Ideal for business and personal management.

VU-TYPE PROFESSIONAL

An enhanced and expanded version of Vu-Type including many 63 Pitman-approved exercises.

[7] £19 (d)

A simple text editor offering the basic facilities of a fully fledged word processor, especially suitable for network environments where ROMs are impractical. Includes a terminal emulator.

BOOKS (No VAT)

COMPUTER SPREADSHEETS

Gives a detailed account of the operation and facilities of computer spreadsheets and discusses popular products such as Lotus 1-2-3, Visicalc and Ultracalc.

INSIDE INFORMATION
A straightforward and comprehensive guide for newcomers to the subject of Information Technology. Accompanying software and audio cassettes are also available.

£9 (d)

MASTERING THE DISC DRIVE

MASTERING THE DISC DRIVE.

A clear and concise guide to the BBC micro disc system. Suitable for beginners to computing or as a reference manual for experienced programmers. £8 (d)

MASTERING MUSIC

Explains how you can exploit the full music-making capabilities of the BBC Model B micro.

THE BBC MICRO AND THE SMALL BUSINESS A book to introduce the lay person to the potential capabilities of the BBC Micro with specific application to the small business.

£6 (d)

TOOLBOX 2 The book to accompany the utility software giving listings of the programs with helpful commentary and diagrams.

Disc.

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HINTS & TIPS

Martin Phillips offers a few tricks to help with debugging and a way to split long programs up into smaller, more manageable, pieces to try to overcome the Beeb and Electron's lack of memory

SQUASHING THE BUGS

I have come to realise that most programs do not work first time; indeed most programs don't work the second or third times either! Just sitting and staring at the program or the listing usually offers very little hope of solving the problem.

If it's a program you've written yourself, it is often the silly things that cause the most trouble; if it's a magazine listing then it is usually a typing mistake such as 'O' instead of a '0', or missing out a line or part of a line.

The usual way of solving the problem is trial and error – keep changing bits and pieces until something happens, or keep comparing the typed-in program with the printed listing, hoping to spot the difference. This often works, but there's far more satisfaction to be had by being able to predict the part of the program where the fault is likely to be, and trying to spot it.

One usually gets a better understanding of programming on the way, and it's a process which gets easier with time. I get comments from readers who say that they hate having to debug programs, yet those same people will spend hours playing adventure games.

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Debugging programs can be just as much fun, and very satisfying – equally it can be just as annoying and frustrating! There are, though, a few tricks to make the debugging process much easier.

Always save copies of the program regularly, so that if something happens to the version you're working on, you can load in the previous one and only a part of the work will have been lost.

I always save programs with filenames that give a version number, eg, SAVE"PROG05". This is also useful when you get into a mess with the changes made, as you can retrace your steps back as far as necessary. If you've a printer and an unlimited supply of paper (printers are rather effective machines for wasting paper), it's not a bad idea to save a print out when saving to disc, and mark each print out with the version number.

You should always put the ON ERROR statements in as REM statements until the program works. That way you can get some idea of what is going wrong. Once the program runs, the REM can be removed and the ON ERROR restored.

- Similarly, always REM any *FX200 call which disables the Escape key and alters the function of the Break key.
- If it's not obvious where a program is going wrong, use the STOP command.

Insert the word STOP at a point where you are fairly certain the program will run to, and then run the program, moving the position of the STOP through the program line by line (or a few lines at a time) until you come across the offending line. I usually put STOP at an inbetween line number so that it's easy to delete and move on.

When a program stops because of an error, it's easy to miss the actual error or the error line. All is not lost, though. Simply type REPORT to see the error message again, and type PRINT ERL to find the line number. If the result is 'at line 0' with no error given, then the program has well and truly crashed. An example of when this can happen is with Basic 1 and the INSTR function: when the search string is longer than the string being searched, the program crashes and this cryptic error message is given.

• If you know an error exists in a certain piece of code, and the problem is a stubborn one, then define a function key to list that part of the code on the screen. For example if the fault in the code lies between lines 180 and 270 then program function key 0 as follows:

*KEY0 MODE7 | M | N LIST 180, 270 | M (Or MODE6 for the Electron.)

This idea is especially useful when the function of the editing keys has been changed by *FX4 or the auto-repeat has been switched off. Another key (or the same one) can have the extra code:

*KEY1 *FX4,0 | M *FX12,0 | M

*FX4,0 sets the editing and cursor keys back to their normal editing functions, and *FX12,0 puts the key auto-repeat and delay back to its normal setting.

Using the function keys in this way can save a lot of typing (and therefore possible mistakes) and makes debugging much easier.

A common error is 'No such variable'. Instead of having a vague look at the offending line of code, try to run the program. List the line and print out all the variables to find which one does not exist. This is very easy to do. An example program line of:

230 FOR J = start TO end STEP N has three variables which need to be predefined: 'start', 'end' and 'N'. Therefore type:

PRINT start

PRINT end

PRINT N

and with luck the problem will now show itself. It's then a task of checking back through the program to find where that variable should have been defined. A common fault is a spelling mistake in the variable name, or capital letters where lower case should have been used. Sometimes all the variables give a value and you're almost back to square one, but now the fault is easier to spot – obviously one of the variables is not what it seems on the screen. Look at the following line.

230 FOR J = start TO endSTEP N Here a space has been missed out, and the dreaded 'No such variable' message appears because the computer thinks that 'endSTEP' is

a variable.

This technique is valuable with arrays, where things such as subscript errors can be very tricky to spot, and being able to print out what's stored in a particular array can be enlightening. A peculiar quirk of BBC Basic is that an element of an array can be printed in the same way as a normal variable after the program has run, but only if the program has not been edited.

As soon as a line of text is altered, the pointers for the array are lost and the elements cannot be printed out.

- on If you have tracked a difficult problem down to a procedure in the middle of the program, and it takes ages to run the program to that point, then save the program, delete everything but the procedure and write a short dummy program call it up with the correct variables. I find this a useful technique when writing programs as I can test a possibly problematic procedure before putting it into the program. Several examples of this technique have appeared in Hints & Tips, where I present a listing with a short sample program to show how it runs listing 1 and 2 on the yellow pages are good examples.
- When editing listings that have no space between the line number and the actual listing, it's a good idea to use LISTO 1.
- The error message routines in BBC Basic are not too bright, and they are easily fooled. Either the error message itself can be incorrect,

ACORN USER MAY 1986

HINTS & TIPS

or the line number given can be different from the line where the error actually is.

PRINTTAB(3,4) "HELLO"

will print "HELLO" near the top of the screen, but if the TAB statement is missed out:

PRINT (3,4) "HELLO"

the error message 'Missing)' is given – obviously incorrect as it's the statement TAB that's missing. When this error occurs, count the number of right and left brackets in the line – they must be equal.

It is possible to have an error line different from where the error occurred; ie, the OSCLI routine needed by Basic 1 users:

10 DIM A 50

20 X% = A MOD 256

30 Y% = A DIV 256

40 \$A = "HELP"

50 CALL &FFF7

When run this lists all the ROMs in the machine – it's the same as typing *HELP, except it's been called from within a program. If a mistake is made in line 40 thus:

40 \$A = "HELPP"

then an error message is given, not at line 40, but at line 50. In this example it is easy to find the problem, but when the OSCLI routine is a procedure called from several points in the program, finding the error can take some time. A common example occurs with the READ and DATA statements. The following program reads five numbers, stores them in an array and also prints them on the screen.

10 DIM A(5)

20 FOR N% = 1 TO 5

30 READ A(N%)

40 PRINT A(N%)

50 NEXT

60:

70 DATA 1,2,3,4,5

However, if a mistake is made in the DATA statement, for example:

70 DATA ,1,2,3,4,5

the error message says:

No such variable at line 30

• Errors are often very difficult to spot when they are in long multi-statement lines. The solution here is to split these lines up so each statement is on a different line, for example:

10 DIM A(5):FOR N% = 1 TO 5:READ A(N%):NEXT

20 . . .

can be split up to become:

10 DIM A(5)

11 FOR N%=1 TO 5

12 READ A(N%)

13 NEXT

20 . . .

This is where it helps to have program lines numbered in tens.

PROGRAMS IN PIECES

A limitation of the BBC micro and Electron is the lack of memory when using graphics. In modes 0, 1 and 2 there is less than 5k when using discs. This has been overcome to some extent with the Master and BBC B+ with shadow modes, but can still cause many difficulties. However, careful program design can often overcome this limitation, and even have several advantages. For instance, imagine writing a program on a 512k machine and having perhaps 100k of program to type in from a listing and then debug!

By now most readers will be familiar with the idea of procedures, and how they are able to break a program up into manageable chunks so that each can perform a specific function. This makes understanding the program much easier, and enables problem areas to be pinpointed quickly and errors cured.

There is a technique whereby some procedures can be stored on disc and pulled into the program as and when required, but this needs very careful planning, and can be quite difficult to debug.

A simpler approach is to divide a long program which uses graphics into several shorter programs, if possible, so it's even easier to follow and sort out any difficulties. A simple example is in the use of instructions, which can be given in a separate program which loads in first. There are other not so obvious advan-

```
10 REM Hints & Tips - listing 1
20 REM by Martin Phillips
30 REM for BBC B/B+/M/E
40 REM (c) Acorn User May 1986
50:
60 MDDE 6
70 PROCINIT
80 PROCSTORE
90 CLS
100 PRINTTAB(10,10) "Press space to loa
d"
110 PRINTTAB(13,11) "next program"
120 REPEAT:UNTIL GET=32
130 CHAIN"H+T2"
140:
150 DEF PROCINIT
160 DIM A$(5),B(5)
170 CZ=&3000
180 A$(1)="This is the first line of text"
200 A$(3)="This is the third line of text"
210 A$(3)="This is the fourth line of text"
220 A$(3)="This is the fifth line of text"
220 A$(5)="This is the fifth line of text"
230 B(1)=1001
240 B(2)=2002
250 B(3)=3003
260 B(4)=4004
270 B(5)=5005
280 ENDPROC
290:
300 DEF PROCSTORE
310 FOR NX=1 TO 5
320 $CX=B(NX):CX=CX+1+LEN(A$(NX))
330 !CX=B(NX):CX=CX+4
340 NEXT NX
```

Listing 1. Defines five strings and stores them . . .

tages to this approach: for instance, BBC Basic does not do much 'garbage' collection so that in a long program a lot of memory can be taken up with spaces reserved for variables, strings and arrays that are no longer required but which the computer does not clear out. Then if memory is tight, after the program has run for a bit it crashes with the dreaded 'No room' error message. However, if the program is broken up, with new programs being

```
are the strings:
                     line of
      i 5
               second
This
This
      is
               third
                    line of
          the
      is
          the
               fourth line of
This
                ifth line of
      are the variables:
Here
       1001
       2002
       4004
```

HINTS & TIPS

CHAINed in as required, all this space is cleared out when the new program is CHAINed. Also, as there will be fewer variables, strings and arrays in a short program, there will be less of a problem with garbage collection anyway.

Splitting up programs into smaller programs can create problems, though. The main one is, how does one transfer data from one program to the next? If there are just a few variables, this is easy. The resident integer variables A% to Z% are not cleared when a new program is loaded, so 26 integer variables can easily be passed to subsequent programs. How can one pass strings and even arrays? Here is a technique which is very simple to operate and can be made to work in a wide variety of situations. All it does is to store integer variables, strings or arrays in 'safe' memory areas, so the next program can use the reverse process to 'load' them in again.

Listing 1 (opposite) is the program to define five strings and store them, together with five integer numbers, into memory locations starting at &3000. Listing 2 then retrieves the strings and numbers and prints them out. When trying this out, do remember to save each program first.

A string can be placed into memory by using the \$ indirection operator, so \$C% will place a string into memory starting at the memory location given by C%. It will also place a return character (&0D) after the string to indicate its end, which needs to be taken into account when incrementing C%. !C% will store an integer variable into four memory bytes starting at the location given by C%.

Listing 2 must be saved as H+T2 for the first program to be able to CHAIN it in. When it has loaded and displayed the variables and strings, try pressing CTRL-Break and then type OLD followed by RUN. The data should still be there, making it a very useful technique.

Perhaps the hardest thing is to find a 'safe' area of memory. This can be any part of memory which will not be overwritten by the program, or by the screen memory area, or by any memory area used by the computer itself. It is often advisable to avoid the first two bytes of a new page of memory if it is below PAGE, as the operating system often puts markers at the start of a page, eg, PAGE&900 (locations &900 to &9FF) are the RS423, sound and speech workspace. Often these are not used, so that this memory area can be used. The operating system puts a marker (in this case &10) at location &900, so to avoid any problems, it is best to start storing at location &902. Thus when Break is pressed, the first byte or two of data will not be corrupted.

```
10 REM Hints & Tips - listing 2
20 REM by Martin Phillips
30 REM for BBC B/B+/M/E
40 REM (c) Acorn User May 1986
50 :
60 PROCinit
70 PROCretrieve
80 PROCprint
90 END
100 :
110 DEF PROCinit
120 DIM A*(5),B(5)
130 C%-&3000
140 ENDPROC
150 :
160 DEF PROCretrieve
170 FOR N%=1 TO 5
180 A*(N%)=$C%:C%=C%+1+LEN(A*(N%))
190 B(N%)=$C%:C%=C%+4
200 NEXT N%
210 ENDPROC
220 :
230 DEF PROCprint
240 CL8
250 PRINT'"Here are the strings:"'
260 FOR N%=1 TO 5
270 PRINT A*(N%)
290 NEXT N%
290 PRINT'"Here are the variables:"'
300 FOR N%=1 TO 5
310 PRINT MEINX
320 NEXT N%
290 PRINT'"Here are the variables:"'
330 FOR N%=1 TO 5
310 PRINT B(N%)
320 NEXT N%
```

. . . to be retrieved and printed out by listing 2

FOR MASTERS

For those who've bought a BBC Master, and put a function keystrip into the new holder only to find that you cannot get it out again, try sticking a write-protect sticker on the keystrip to make a small tab – it can then be removed easily.

While on the subject of write-protect stickers, here is a tip for those who are also interested in car maintenance. If you have a timing light but it is not bright enough to show the markings on the flywheel, cut a notch in a silver write-protect sticker and stick that in the right place on the flywheel. This then reflects the light so that the timing can be set, the notch indicating the correct timing point.

When making a backup of a disc, always make sure that the disc to be copied has a writeprotect sticker on it.

Vertical print is simple with the use of text windows. This program gives an example:

10 CLS

20 VDU28,20,16,20,5

30 PRINT "Acorn User"

40 VDU26

Notice that the left-hand and right-hand coordinate of the windows are the same value. Try leaving off the VDU26 (restore default window) to see why line 40 is necessary.

QUICKFIRE QUESTIONS

Darren White from Chelmsford would like to know how to disable any ROMs in his machine. First find out the ROM number (see Hints & Tips February '86) and then add this to the number &2A1. So, if the ROM in socket three is to be disabled, type ?&2A4=0. When this has been done, pressing Break will reset it, so if a disc auto-boot program is to be loaded, type either: *EXEC !BOOT or *RUN !BOOT. Depending on the type of !BOOT file, this is exactly the same as using Shift-Break, except that the computer is not reset first. If it's possible to catalogue the disc, at the top right it will tell you whether to *EXEC (option 3) or *RUN (option 2) the disc.

Mr Grimason from Portadown would like to know if his *Wordwise Plus* is faulty because it will not display more than two or three pages in the 80 column preview mode. This is quite normal: *Wordwise Plus* reverts to 40 column preview mode if there is not enough memory space left to go into 80 column mode.

Mrs Chesterfield from Bristol wants to know how to calculate how many data files can be stored in memory and on disc.

First the number of bytes in each record needs to be calculated.

To do this add one to the number of bytes allocated to each field in the record and then add these lengths together.

To find out how much memory is available in the computer to store a complete record, you will first need to run your database program so that it sets all its own workspace. Then leave from the program by pressing the Escape key and enter:

DIM P% -1

PRINT HIMEM - P%

The figure printed will be the amount of 'free' memory remaining. All you need do is divide the number of bytes required for each full record into this to give you the total number of records.

On disc the maximum storage space (assuming a newly formatted blank disc) is:

(number of sectors-2)*256

On a 40 track disc this gives 97,280 bytes and on an 80 track disc 199,680 bytes. Again, dividing the record length into this will give the maximum number of records.

If you need to have other programs coresident on the disc you'll have to subtract the file length of each from the bytes free value before dividing this by the record length.

FRST BYTE

TRANSFERRING YOUR AFFECTIONS

First Byte offers advice on the best way to transfer your programs from tape to disc

Tessie Revivis

In the early days with my computer, my big ambition was to get the cash together to buy a disc drive. This was about four or five years ago and my first disc drive was a single sided 40 track affair, which (I think) cost about £300! Nowadays such drives can be picked up at a fraction of the cost – less than £50 in most cases, while an 80 track drive can be yours for around only £80 (or about £150 for a Plus 3 for the Electron).

I don't propose to spend this month's First Byte chatting about disc drives but about the problem that confronts all users (other than lucky Master owners!) who upgrade from tape to disc – the subject of transferring your programs and games. If you are looking for information on disc drives I would direct you to two articles by Bruce Smith in the July 1985 and February 1986 issues of *Acorn User*.

When confronted with a problem of this type it's a good idea to break it down first into the steps you need to achieve, and then develop these into a program. The steps required for the tape to disc program are: 1) select tape filing system; 2) load program; 3) select disc filing system; and 4) save program to disc.

Overwriting software

The first problem you come across is that if you write a program to do the above, loading a subsequent program from tape will overwrite your transfer software! You can get around this, though, by using a function key to hold the instructions. For example, if we have a tape file called GRAPHICS, the program steps that would be required are:

*TAPE

LOAD "GRAPHICS"

*DISC

SAVE "GRAPHIC"

We've had to shorten GRAPHICS to GRAPHIC because disc filing systems will allow only seven characters in a filename. The key definition therefore becomes:

*KEY0 *TAPE | MLOAD"GRAPHICS" | M*DISC | MSAVE "GRAPHIC" | M

Pressing function key f0 at any time will therefore effect the transfer.

The above method works happily with straightforward Basic programs, but it won't work with machine code programs or data files or text files from a wordprocessor, for example. These can be transferred but you have to use the operating system equivalents of LOAD and SAVE; that is, *LOAD and *SAVE. Both of these star commands need information other than just the filename - they need to know the start and end addresses of the file in memory. To find this out, first catalogue the program with the tape system's extended catalogue information facility enabled. To do this type *OPT 1,2 after which the file can be catalogued. If our example file GRAPHICS was a data or machine code file on tape, the procedure would be:

*OPT 1,2

*CAT GRAPHICS

When the last block in the program has been reached the extended information will be displayed – it might look like this:

GRAPHICS 01 0200 00002000 00002000
The information presented here, in order, is:

GRAPHICS — the filename

01 — the block number

0200 — the file length

00002000 — the *LOAD address

00002000 — the execution address

The filename is obvious. The block number tells you the number of blocks used to save the program, a block being 256 bytes long (if you listen to a computer tape it's the noisy bit!).

Hex values

The file length is a hexadecimal value and leading zeros can be ignored, so the length of this file is &200 bytes. This value, combined with the file load address (&2000) is what is needed to transfer a simple data or text file from tape to disc.

To transfer this file we need to first *LOAD the file ignoring leading zeros to the specified load address – &2000 in this case – and then

*SAVE the file by specifying the start address (as given above) and the end address. To calculate the end address we simply add the file length to the start address:

&2000 + &200 = &2200

The format of the *LOAD and *SAVE commands is:

*LOAD "Name" LLLL

*SAVE "Name" LLLL EEEE

where LLLL is the hexadecimal load address and SSSS the end address, also in hex.

Using the format described above, the transfer sequence becomes:

*TAPE

*LOAD "GRAPHICS" 2000

*DISC

*SAVE "GRAPHIC" 2000 2200

As before, this can be put into a function key if so desired.

Machine code programs can be loaded in from tape in exactly the same way, but before they can be saved we have to know their run or execution address, which is the last value specified in the extended information. In the above instance it was &2000, the same as the load address, but this may not always be the case. The specification for a *SAVE of a machine code program is:

*SAVE "Name" LLLL EEEE RRRR
where RRRR is the run address. If GRAPH-ICS was a machine code program the 'save' line would need to be amended to:

*SAVE GRAPHIC 2000 2200 2000

The above 'star' method is fine, as long as the load address for the program is not less than &1900 (&1D00 for the Advanced Disc Filing System [ADFS]). If it is lower, problems can occur when trying to transfer it because the value of PAGE is at least &1900 when a disc filing system (DFS) or ADFS is installed. On a tape-based system PAGE is set to &E00. The DFS therefore claims at least 2.75k of memory in which it can perform its functions. Loading a program into this area of disc workspace can result in the corruption of the program before you save it. In the case of ADFS you will

FIRST BYTE

probably not even be able to save the program in any form at all as it will corrupt the disc catalogue which the ADFS stores in this area of memory.

Saving the data

In cases such as these you can load the data or machine code into a 'foreign' area of memory and then save it as though it was saved from its expected address.

As an example, suppose a tape-based program called DUMP gave the following extended catalogue message:

DUMP 03 0300 00000F05

Here we have a file &300 bytes long, with a load address of &F00 and an execution address of &F05.

To load this file at a new address, proceed as usual but use a new load address (&2000 for example) thus:

*TAPE

*LOAD DUMP 2000

The *SAVE command can have a fourth and final parameter added to it – the relocation address – and it's this which is used to fool the DFS into adding the correct loading address to it. The format of the command in full is:

*SAVE "Name" SSSS EEEE RRRR AAAA

where AAAA is the actual load address. To complete the transfer the following two lines are required:

*DISC

*SAVE "DUMP" 2000 2300 0F05 0F00

The above raises the question of how we get the program to load and run below the DFS value of PAGE: more on this in a moment.

The approach detailed so far for loading and saving programs, data and machine code files is effective, but if there are a large number of files to be transferred, tedious. Listing 1 on the yellow pages is an automatic program which will do the lot for you – all you need do is run the program, making sure that the tape containing the programs to be transferred is in the cassette recorder and a blank formatted disc is in drive 0. The program is intelligent and copies all types of files.

Once you have your programs on disc you can, in most instances, simply load them in and use them as normal. There are times though, when perhaps because of the program's size, it will only run as though it is a tape-based program with PAGE set to &E00.

Such programs can still be used but you need to employ a routine to relocate the program. In simple terms you need to load the program in from disc; select the tape filing system; move the program down to &E00; and then run it.

Basically what's required is a short routine

which takes the bytes of memory from PAGE to TOP (the top of your program) and puts (or pokes) them into memory starting at &E00, and ends by resetting PAGE to &E00 and running the program. Listing 2 on the yellow pages can be added to the end of your program to perform the task.

After you've loaded your program in from disc, type:

GOTO 10000

and the program will be relocated and run.

Machine code programs can be treated in exactly the same way, but PAGE and TOP should be replaced by the load and end address of the file, and the RUN by a CALL to the execution address, ie, CALL &F05 in the case of the DUMP program described earlier.

Protected files

All that I've described so far will work happily provided the software you are tyring to transfer is not protected in any way. Protection is, in many cases, ingenious programming by the software writer that will not allow you to make extra copies of the program. If you can't catalogue the program or get it to produce extended messages, the program is almost certainly protected.

Programs of this type can still be transferred but need transfer routines which are too sophisticated to be described here or, due to their length, listed in *Acorn User*. However, there are many ROMs available that will transfer programs from tape to disc for you.

Watford Electronics, for example, sell *Transferom*. This will cope with most (though not all) protected programs including very long adventure programs. It is menu driven which means that it provides you with options which you select by pressing a particular key. *Transferom* is for the BBC micro.

Slogger Software markets *T2P3* (a Tape to Plus 3 transfer ROM) for the Electron which is easy to use, though you'll need a ROM expansion box into which to insert the ROM.

Replay is the current state-of-the-art answer to tape to disc transfer, available for the BBC B. This consists of a ROM and some hardware which must be attached inside the computer. Once installed it will cope with virtually any program you care to put to the test.

To sum up, transferring your own programs from tape to disc is straightforward and listing 1 will cope well. Commercial software is generally protected to prevent copying and in such instances you'll need a ROM to perform the task for you.

How to enter and use the program

The T2D (Tape 2 Disc) program is written entirely in Basic and should present you with

no real problems when entering it. When it is complete you should save it to disc using the filename 'T2D'.

To test the program take a blank tape and save about half a dozen programs onto it, one after the other (you could use the T2D program and save it six times using a different filename each time). When you have done this put a blank formatted disc into drive 0 – in fact you can use a disc containing files as long as there is enough room to take the files from the tape. Load and run the T2D program, and follow the instructions presented on the screen. After you press any key the first program will load from tape. The tape will then stop and the program will be saved to disc. This process will repeat until all files on the tape have been loaded in and saved to disc.

The program cannot tell when all the files have been transferred. Once you are sure that they have been, or the tape has wound through to its end, press the Escape key. Type *DISC followed by *CAT. You should see the six files in place and these can now be loaded in and used in the normal way.

The program relies on the cassette recorder having a motor control on it so it can be turned on and off while programs are being transferred. If your cassette player does not have this facility, you'll need to do one of two things. First, to stop the tape after each program has been loaded in, or second, to leave a few seconds gap on the tape between each file as you save it. In practice, however, you will probably not need to do either as the transfer will be so quick the tape will not have reached the next program when T2D comes to load it in.

If you have a double sided or dual drives you can adapt the program to save on to whichever disc surface you want, simply by adding an extra line:

315 *DRIVE 2

Insert the drive number to suit yourself. The above would save the file on drive 2.

PRODUCT DETAILS

Transferom - £25.30

Watford Electronics, Jessa House, 250 Lower High Street, Watford, Herts. Tel: (0923) 37774.

T2P3 – £19.95

Slogger Software, 215 Beacon Road, Chatham, Kent. Tel: (0634) 52303

Replay - £35.00

Vine Micros, Marshborough, Sandwich, Kent. Tel: (0304) 812276

See yellow page 105 for Tessie Revivis' T2D program listing

-ETTERS

Write to Letters, Acorn User, 141-143 Drury Lane, London WC2B 5TF

MASTERING THE ELECTRON

Sir, Congratulations to Acorn on the latest computer, the BBC Master – it's now by far the best on the market. I especially like the ROM facilities, pinched from the Electron's Plus 1 unit.

I'm an Electron owner and although I like the Master very much I will probably stick with my machine for a while.

Which brings me to the point of this letter. It is my experience (humble though it may be) that tape and disc drives are a pain in the backside and that permanent memory RAM units are the solution to the problem.

If the boys at Acorn could upgrade the Electron's Plus 3 unit, replacing the discs with a solid state permanent memory filing system and include with it a numeric key pad, it would please me no end.

G C Warren Surrey

LEGAL AND DECENT?

Sir, I have recently come across a situation that is probably very familiar to those readers of Acorn User who have tried to obtain equipment from mail order companies, but I have seen little comment on this subject in the correspondence columns of any of the popular home computer magazines. I refer to the highly misleading advertisements that regularly appear from many large and famous companies offering equipment that they do not carry in stock, have not had in stock for some time, and whose true prices bear little or no relation to the figures quoted in the published advertisements.

A recent attempt to buy disc drives gave plenty of examples of this dubious practice. A wellknown company received my order, but I heard nothing for two months, in spite of writing again. Eventually, I phoned them, only to hear they had not had the item in stock for the whole period in question and wouldn't be getting them for another month, Meanwhile adverts, with steadily rising but entirely fictitious prices, regularly appeared in the press. The likely price applicable when they would have stock to send out would be some £50 more than that published when I had originally ordered.

I then telephoned every company in the February issue of *Acorn User* claiming to sell this particular item. Most did not have the disc drive, and those which did were selling at prices substantially above those advertised.

This occurred so consistently that it was hard not to believe that the microcomputer business has adopted the practice of placing ads of goods they know they cannot provide, at prices they have no intention of honouring.

Another example was Gemini's Datagem, offered by two companies at big discounts. One company has advertised this price regularly, in spite of having no stocks of the item. The other 'sold out' of the reduced price stock while the ad was still current.

I think we can all accept price rises, selling out of stock and similar events. However, the habit of advertising 'fantasy' goods at 'fantasy' prices seems more a cynical manipulation of the customer. Presumably the companies benefit, though I rapidly saw the advantages of going to a High Street

dealer. Does the home computer trade really need to work like this?

Dr G P Harper

There have been a spate of complaints about disc drives, and the Advertising Standards Authority investigated Akhter, Microman, Tiger, Twillstar, Viglen and Watford. In each case the company was judged to have been caught by an unexpected price rise and, because it had acted in good faith, the complaints were not persued. Vigilance is vital and the motto is to check before ordering.

ART INTO SUPER ART

Sir, May I point out a small inaccuracy in Jonathan Inglis' review of the AMX Super Art package in the March edition of Acorn User. He expressed disappointment in being unable to load pictures previously created with the old Art programs.

It is perfectly possible to load old screens into *Super Art* – you simply have to select option LOAD B&W (black and white) from the Goodies menu and then supply a filename.

The picture can then be saved in *Super Art* format by selecting option CREATE from the file menu. The picture in figure 1, for example, is one of several that I have successfully transferred.

Keep up the good work (Acorn User and AMS!).

Chris Parker Peterborough

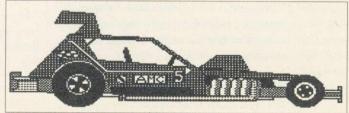


Figure 1. A car successfully driven from Art into Super Art

FLIGHT Knowledge

Sir, I am extremely interested in flight simulation programs. I have all the programs available that I have knowledge of, but I'm sure there are more.

I am looking for someone to help in designing a definitive flight simulation program. Through my knowledge of real flying, general interest in aviation and seeing the good and bad parts of the many flight programs that are around at the moment, I feel that I am in the position to be able to offer the basis for a very realistic package indeed.

I have no knowledge of programming the BBC B but of course I have basic knowledge of the machine's operation.

I would be very pleased to bear from any individuals, companies or software houses who have a flight simulation program which is not generally available or from any party interested in my idea. I really would like to get this 'off the ground'!

Alex J M Ford

Western Engineering, 27 Colne Avenue, West Drayton, Middlesex UB7 7AJ

ALONE IN OZ

Sir, A lonesome BBC owner would like someone in Australia, preferably in Sydney, to write to, to swap games, ideas, etc.

Also anyone in a user group in Sydney who would like another person to join could ring me or write a letter.

I will send a reply to every letter as quickly as I can. Please write to me at 9 Cudal Place, Carlingford, Sydney 2118, Australia. Tel: 8722534.

Matthew Weir

LETTERS

128k B+ SHADOW

Sir, When February's issue of Acorn User arrived I was very interested to read Joe Telford's article on shadow RAM, having bought a 128k BBC B+ with View 3 three weeks earlier.

On the other hand I was somewhat amazed to see the news about the new Master series of machines. I think Acorn has a cheek to run two page adverts for the 128k B+ one month and then announce its successor the next!

I am very pleased with my new machine but would have hung on and saved myself the cost of *View* if I had known about the Master — or for only a tenner or so more I could have had an on-board second processor.

Anyway, could you please ask Mr Telford if he would write about uses for the 12k of sideways RAM above the screen RAM on the B+ – is there any way to use it as a printer buffer, for instance?

Meanwhile, I console myself with the thought that the 128k B+ is probably more software-compatible than the Master series; at least one can still transparently load soft-key definitions, etc, in the usual way.

PS: Has Acorn been taking lessons from Amstrad?

Paul F Tolson West Yorkshire

WHY NO SUPPORT FOR THE 6502?

Sir, I am writing to explain my frustration at Acorn's range of product. At great expense (since I was still at school) I bought a BBC B three years ago. Unlike many others, I am a serious programmer and was disgusted by the Beeb's low memory capacity. The 6502 second processor was therefore the next logical purchase. The support for this product from Acorn was, and still is, abysmal. Also, unlike decent machines, no

monitor or drives were included with the BBC B.

Thank goodness I didn't upgrade to a B+ – an obvious stopgap to keep Acorn afloat. And now the new Master Range. Congratulations Acorn – it looks like a winner! It also looks as though a death warrant has been signed for the model B.

From constant use, my second processor now refuses to work, and I have the equivalent of an elephant on my desk (my Beeb and its peripherals).

Like many other Beeb owners I feel cheated and disgusted at the lack of support for the 6502 second processor. I am now studying for a Computer Studies degree, with the aim of becoming a systems analyst. So goodbye Acorn—my next machine will not be a revamped fossil. It will be a genuine 32 bit, drive and monitor inclusive, machine for the 1990s. I have learnt by my mistakes.

I S Gibson Kent

PRODUCING STRIPS

Sir, Wanting to make a new function key strip for a program I was writing recently, I turned to Computer Concepts' *InterSheet*.

The technique proved to be simplicity itself. Columns A and L of the sheet are set to three characters wide, and columns B to K (10 columns, corresponding to the 10 function keys) are each set to nine characters. The labels needed are then typed into the 10 columns, using centred justification. By using the 105 column display mode, the whole key strip can be seen at one go, and the layout is thus easily checked.

Finally, the print command /P 27,64,27,77; is entered, which sets the printer (Epson or Canon) into elite-sized characters. Columns A to L are then printed, and heypresto: the key strip is produced.

David N Waters
Bucks



This lady was produced by Graham Owen - can you help him create better?

HELP ON GRAPHICS

Sir, I am a research student at Manchester Polytechnic, my interest being in computer graphics.

Could I through your letters page ask for a little assistance? I would like to hear from any reader who's into computer drawing of any kind. I am interested in any drawing programs or pictures for any purpose whether purely artistic, graphic or technical.

The work could have been carried out on a commercial package and be black and white or colour, then dumped to plotter or printer. I would also be interested in software designed by individuals, or any recommendations readers might make about any particularly useful programs or utilities.

To finish on a high note: I very much like the new magazine design and layout, and the high standard of editorial content. It appeals to a wide readership, and also to the continuing newcomers to computing (no, I'm not crawling!).

Graham Owen

M A Studies, Department of Communication Arts and Design, Grosvenor Building, Cavendish Street, Manchester M15 6BR

Two addresses which may be of help are those of SIGGRAPH UK, 129 Ardmore Lane, Buckhurst Hill, Essex IG9 5SB and ACADE, c/o Hugh Anderson, Faculty of Art & Design, Middlesex Polytechnic, Cat Hill, Barnet, Herts EN4 8HT.

INVALUABLE SOFTWARE

Sir, There are many useful engineering software and hardware developments taking place in such subjects as structures, electronics and graphics in places like Harwell, Sussex University, Nottingham, Kings College, etc, which to the serious user could be invaluable.

As a regular Acorn User reader, I have not come across a survey of available software in this category. Also, the modem/mainframe accessibility to these programs could be a boon in the future. Can Acorn User advise where a comprehensive list of available programs can be found?

T Williams Sussex

We do not know of such a list, but would like any readers who are aware of such to send us in one, or let us know where it can be found.

The news pages do try to cover software of this kind, and we actively encourage people to pass information through our free ad and £10 ad pages – not to mention setting up a user group.



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SPEAK TO ME PLAINLY

Sir, I am a relative newcomer to computing and to Acorn User but I don't believe I'm a complete dope! However, on reading some of the March issue I begin to wonder.

Take 'Master Work. Our technical editor takes the lid off the simplest of Acorn's new series of micros'. I'm OK until the paragraph about the Break key - I'd love to be able to turn mine off and I suspect that many other owners would too. In the next sentence I'm floored because I don't know about the 'software key'. Presumably this is *KEY 10 but it's hardly calculated to endear me to your technical editor.

On page 74 I'm invited to read about the memory map and study 'figure 1'. As this is two pages away I need a second copy of the magazine - if the photo on page 74 was swapped with figure 1 the problem would have been solved. Problems with the layout of articles are a regular occurrence in computer publications.

Lastly, can I make a plea for plain English? Each edition contains a wealth of (I presume) useful information but it's written in jargon. I believe most areas of computing can be explained in words of two or less syllables. I enjoy reading Acorn User (some of it anyway) so please accept my criticism in the constructive spirit in which it is intended.

Brian Bowell Mid Glamorgan

UNFAIR CRITICISM

Sir, I was disappointed to see part of a letter of mine which was published in November's issue of Acorn User quoted by Beebug/ Beebugsoft in an attack on you.

My original letter to Acorn User was edited and had the full text been published readers would

have seen that my rebuke related to a few specific articles rather than Acorn User as a whole.

In fact Acorn User is still my favourite even though I subscribe to Practical Computing, Personal Computer World and Beebug. I've subscribed to both Beebug and Acorn User since their beginnings.

When my truncated letter was published n November 1985, I had intended to write to congratulate Acorn User on its content. I regret not having done so as Beebug has now published two small quotes from my published letter as its response to some valid criticism appearing in Acorn user.

I don't want to take sides but if one compares a typical issue of Beebug with Acorn User, the difference in size and presentation of content is staggering.

As a member of a 'a totally independent user group' (Beebug page 2, issue 1, April 1982) one noticed the gradual dropping of the original aims so admirably expressed in the first issues.

Publications Beebug Ltd, Beebugsoft Ltd and PMH Mailing Services Ltd gradually made their presence known. After a while the turnover must have exceeded £1 million annually if one adds in the income from subscriptions, software, distribution deals with High Street multiples and Computer Concepts, the Electron side of the business, hardware sales, advertising, etc.

As a 'member' I had often wondered why discounts obtained from suppliers were never fully passed on to the other members in the form of lower prices. In fact, Beebug's own hardware prices always seemed to be near or at the maximum recommended price. There are dealers selling the same or very similar items at lower prices and some of them advertise in Acorn User.

The members' 25 per cent software discount is smaller than the trade discount at which I can usually purchase some of the excellent Beebug products.

Is it too late to revitalise the original aims of the 'Independent National User Group for the BBC Microcomputer' which, incidentally, on its May 1985 cover proclaimed itself to be 'Britain's Largest Computer User Group. Membership exceeds 30,000'?

Finally, may I assure everyone that I am not 'disgruntled readers' but merely one person, despite what Beebug printed.

> Paul Janik Jersey

EPSON

Sir, I have just bought an Epson P40 which is good value for money and performs all my needs easily - until I wanted screen dumps in modes 1, 2 and 4. I tried the printer dumps given in your magazine for other Epson printers but to no avail. Can anyone help?

Andrew Jackson

Essex

Latest round-up of games high scores

Aviator	Acornsoft	30,450	P Hopgood*
Android Attacl	k Computer	1,495,105	Tim Hedger*
	Concepts		
Arcadians	Acornsoft	98,020	Niaz Islam*
Battletank	Superior	108,500	Stephen Corcoran*
Castle Quest	Superior	2,240	Peter Simpson*
Chukkie Egg	A&F	30,275,420	Stephen Corcoran*
Crazy Painter	Acornsoft	279,790	Richard Arundale*
Cybertron	Micro Power	715,960	Niaz Islam*
Mission			
Fortress	Pace	129,250	Stephen Corcoran*
Frak!	Aardvark	20,000,200	Paul O'Malley*
Free Fall	Acornsoft	5,024	Philip Comber*
Hopper	Acornsoft	52,422	John Durrans*
JCB Digger	Acornsoft	131,450	Stephen Corcoran*
Killer Gorilla	Micro Power	836,475	Stephen Corcoran*
Match Day	Ocean	10-0	Matthew Pedeaux
Meteors	Acornsoft	498,500	P Ludgate*
Missile	Gemini	469,225	Ian Boffin*
Control			
Monsters	Acornsoft	283,000	Stephen Corcoran*
Mr Ee	Micro Power	944,350	Stewart Roberts
Moonraider	Micro Power	642,125	Stephen Corcoran*
Overdrive	Superior	338,450	David Perry*
(BBC)			
Overdrive	Superior	1,011,720	P Ludgate*
(Electron)			
Painter	A&F	203,690	Nigel Shaw*
Pengo	Watford	300,400	Stewart Roberts
Planetoids	Acornsoft	3,186,450	Stephen Corcoran*
Pole Position	Atari	384,250	Niaz Islam*
Rocket Raid	Acornsoft	161,460	Roger Austin*
Snapper	Acornsoft	1,839,210	Peter Simpson*
(BBC)			
Space	Virgin	4,890	Mark Bradshaw*
Adventure			
Starship	Acornsoft	8,420	Ian Boffin*
Command			
Zalaga	Aardvark	23,460,500	Ian Boffin*
+0 1		200	

*Scores unbeaten since February 1986

Please say whether your score was notched up on a BBC micro or Electron when sending in your games high scores as in future issues we'll be publishing separate tables for each micro.

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ROM for the GLP.

Single, double and quadruple density graphics modes as well as four character widths and super/sub script printing are also supported, along with many other facilities normally found

along with many other facilities normally found on printers costing twice as much.

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GLP is bidirectional logic seeking. Has a 9 needle print head. Now available in Serial, Parallel or QL compatible. Please specify.

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magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

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It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

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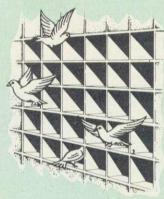
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Continued



The ULTIMATE DFSs for the BBC MICRO

WATFORD TOPS THE DFS CHART

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In concluding, the reviewer writes "It must be said that Watford's DFS

certainly offers a comprehensive range of facilities at a very attractive price". (Please write in for comprehensive details.)

Just compare the features:

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Features	1.20	Single Density	Double Density	
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Max disc capacity	800k	800k	1440k	
Tube compatible	Yes	Yes	Yes	
Built-in Editor	No	Yes	Yes	
Built-in Formatter	No	Yes	Yes	
Built-in Verifier	No	Yes	Yes	
MRUN a file	No	Yes	Yes	
MLOAD a file	No	Yes	Yes	
Extended RENAME	No	Yes	Yes	
Selective COPY	No	Yes	Yes	
Default file name	No	Yes	Yes	
Disc space			100	
distribution	No	Yes	Yes	
40/80 Software		1000000	100	
Switchable	No	Yes	Yes	
Wide catalogue	No	Yes	Yes	
Close open files	No	Yes	Yes	
Improved OPENOUT	No	Yes	Yes	
Copy between				
densities	N/A	N/A	Yes	
OSWORD &7F	Yes	Yes	Yes	
Full entry point				
compatibility	Yes	Yes	Yes	
Retain information				
over a break	1.20	1.43	1.53	
	partial	Yes	Yes	
Sames compatibility	Yes	Yes	Most	
conet file server	Yes	Yes	Yes	
conet station	Yes	Yes	Yes	
full wildcard				
facilities	No	Yes	Yes	

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for three years, and has gained a large following amongst serious users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. (P.S. Watford's highly sophisticated DFS is fully compatible with

PRICES

Complete	Disc	Interface	Kit	incl.	DFS	ROM	8	fitting
instructions								£47

Acorn's DFS Kit complete

DFS Manual (Comprehensive) (no VAT) £6.95 Our comprehensive DFS Manual covers both Acorn & Watford DFSs)

Watford's sophisticated DFS ROM only

£16

We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only

£12

DNFS ROM only £17

ADFS ROM only £25

Watford's DFS is exclusively available from Watford Electronics. Every ROM carries a special label with our LOGO and serial number.

WATFORD's DOUBLE DENSITY **DFS INTERFACE**

The DDFS from Watford Electronics represents a new standard in DFSs for the BBC micro. This is a double density version of our popular single density DFS, and combines all the features of this powerful DFS with the advantages of a system that gives 80% more storage per disc in double density mode. P.S. — Please note that not all DDFSs are capable of providing either the full 80% storage increase, or of allowing a file the full size of the disc — Ours allows both of these! Operates both in Single & Double Density modes.

The typical piece of games software these days is provided upon a protected disc. In order to work on any double density system (including the others on the market) a protected piece of software needs to make calls through the OSWORD &7F routines. To ensure compatibility, the Watford DDFS features probably the most comprehensive and powerful 8271 emulation ever written for a double density system.

PRICES

Complete DDFS Kit incl. fitting instructions DDFS Manual (no VAT)
 We will exchange your existing Single Density DFS Kit for our DDFS Unit at

Watford Electronics DDFS PLUS for the BBC B Plus

Watford Electronics was the first company to produce a serious alternative Disc Filing System (DFS) for the standard BBC micro. Since then, we have been refining and advancing this sophisticated product right up to today.

Now WE'VE DONE IT AGAIN; Watford proudly presents the Double Density Disc filing system for the BBC B+, with all the advantages of the advanced Watford DDFS available on the new BBC B+ DDFS.

Acting as a powerful alternative DFS to Acorn's '1770 DFS' supplied with the BBC+, this superb addition to any BBC+ greatly enhances it's performance with a simple fitting operation.

performance with a simple fitting operation.

DDFS PLUS incorporates all the features of the Watford's popular DFS & DDFS for the BBC B, (at the same time retaining full compatibility with Acorn DFSs), plus it has the following extra features:

Automatic density selection – Full single and double density operations – Extremely powerful and comprehensive OSWORD &7F emulation – Any file can be full size of disc – Density of last access assumed for speed – Automatic 40/80 stepping swapped on error – All Acom's extra disc commands implemented.

As you can see from the above information, Watford's DDFS for the BBC+ is far more sophisticated and well thought out than the standard. Take any disc produced by any Watford DFS from the standard BBC and catalogue

straight off with no problems.

Unlike the Acorn 'ADFS', our DDFS+ system is just as easy to use as the standard DFSs, with no new complex concepts to have to learn. The features within our DFSs have been constantly enhanced over a period of three years during the time that they have been released; significant attention has been paid to feedback from our customers so that the features offered are carefully

honed to the requirements of hobbyists and serious programmers alike.

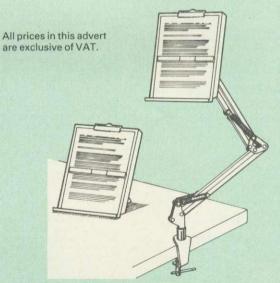
The Watford DDFS+ is supplied with a comprehensive DDFS manual that explains the basics of disc drives, DFSs, etc. Priced at only £30 including the manual, the Watford DDFS+ is surely one of THE best buys you could make

for your BBC B+!

Join the leaders in BBC peripherals; join Watford Electronics – committed to supporting the BBC micro.

> DDFS PLUS (for BBC Plus) £30 (Price includes comprehensive manual)

COPY HOLDERS



How often have you been about to type hand written notes into your computer when you find that there's nowhere to rest the paper or that your notes are resting at the wrong angle to read the type? Whether the notes be your latest program or the draft of a new trilogy, the new Manuscript Holders from Watford are superb for holding your paper at the ideal height and angle to allow you read and type in ease and comfort.

Available in desk resting and shelf clamping versions, these two units hold your paper firmly by means of a magnetic ruler and a clip grip

Mounting to a convenient flat surface, the two joint anglepoise Manuscript Holder allows the paper to be positioned at virtually any convenient angle whilst only taking up a fraction of the surface area that the paper being held does

The smaller desk resting Manuscript Holder is useful for the more organised desk where the problem is simply holding the paper at the right angle.

Whatever desk arrangement you use, surely you deserve a Watford Manuscript Holder!

> Amazing value at only Desk Top £10 (carr. £2) Angle poise £17 (carr. £3)

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates the single density capacity. The double density storage capacity is second one, (that within the brackets). All disc Drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track and which are 80 track. The 40 track ones are manufactured by EPSON, the world famous Japanese company, (non-tinted boxes). The 80 track drives are famous MITSUBISHI drives (tinted boxes).

With two prices in a box (e.g. £295/£299), the first price is for the standard drive and the second for the same unit in switchable type. Users of either of the two Watford DFSs will not need switchable drives as their DFS will provide software switching for them.

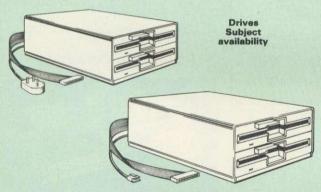
All our Disc Drives are Double Sided and will operate in both Single and Double Density modes. Extensive experience of the usage of disc drives suggests that the MITSUBISHI and EPSON drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.

Various other "manufacturers" of disc drives for the BBC micro (more various order influence of the manufacturers drives with their own name). We buy the high quality Epson and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb

deal.
Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate: extensive tests within our workshops have confirmed this. All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. (Ideal for Schools & Colleges. All single disc drives with power supply, (i.e. CS100, CS200 & CS400S) are supplied in a twin case with twin data cable for later inclusion of a second drive). At Watford we anticipate your needs of tomorrow not just today! tomorrow not just today!

When using a BBC Micro, most people find themselves preciously short of space. The Watford's BBC Micro Plinths form an ideal way of recovering some of this space; your BBC, disc drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. Some of our competitors offer disc drives built into plinths, but these aren't as sensible as you might think. With a Watford Plinth, your disc drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen and paper, reference manuals, etc. Follow the trend with Watford Plinth Watford Plinth.



Capacity	Drives without P.S.U.		Drives with P.S.U.		
Сарасіту	Single	Twin	Single	Twin	
100K (180K)	CLS 100 £75		CS 100 £116		
200K (360K)	CLS 200 £102	CLD200 £185	CS 200 £116	CD200 £199	
400K (720K)	CLS 400 £104 £105 CLS400S	CLD 400 £185	CS400 £123 £124 CS 400S	CD400 £205	
800K (1.44M)		CLD800 £194 £195 CLD 800S		CD800 £218 £219 CD 8005	

TWIN Disc Drive Case, complete with Power Supply & Cables £35 Securicor carriage on Disc Drives £6

C = Cased Drive L = Less PSU

D = Double

Suffix S = 40/80 Switchable

MYSTERIES OF DISC DRIVES & DFS REVEALED

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

For instance, what is the difference between single and double density formats, how can you use a 40 track disc on an 80 track disc drive? What is the difference between a DFS and disc interface kit? Should you acquire a single Disc drive or twin? What does 48 TPI and 96 TPI discs mean? These are just a few of the questions you may have asked yourself and never found the answer or maybe you have yet to encounter these questions.

Now the mystery of buying a suitable interface and disc drive for your BBC micro is revealed in Watford's new book entitled 'MYSTERIES of DISC DRIVES & DFS REVEALED'. It describes in fine detail, yet remaining very readable to the beginner, how disc drives operate, the type of interfaces available, which type of discs to use on a disc drive and how data is stored on

£5.95 (Book No VAT)

3M-DISKETTES

Top quality 3M - SCOTCH Diskettes from Watford Electronics (Your 3M Appointed Distributors). All our discs carry a lifetime warranty. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied complete with self stick disc labels and write protect tabs.

> $10 \times 5\frac{1}{4}$ " S/S D/D 40 Track Diskettes $10 \times 5\frac{1}{4}$ " D/S D/D 40 Track Diskettes $10 \times 5\frac{1}{4}$ " S/S D/D 80 Track Diskettes $10 \times 5\frac{1}{4}$ " D/S D/D 80 Track Diskettes £13 £20

10 × 3½" S/S D/D 40/80 track Discs
 10 × 3½" D/D D/D 40/80 track Discs

£25

FREE Durabeam Pocket Torch with every two boxes of 3M Diskettes purchased from us this month

TOP QUALITY 54" DISKETTES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs. Each Disc has a reinforced hub ring and carries a lifetime guarantee. These are supplied complete with selfstick labels and packaged in an attractive plastic library disc box to protect them from damage. We strongly recommend these Discs.

DON'T SETTLE FOR LESS, BUY THE BEST

10 × M4 S-S D/D 40 Track Discs £10 10 × M5 D/S D/D 40 Track Discs £12 10 × M7 D/S D/D 80 Track Discs £17

● 3" Double Sided Discs £4 each

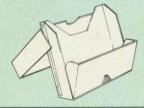
(For special Bulk Offer, see page 2 of our advert)

LOCKABLE DISC STORAGE UNITS

Strong plastic case that afford real protection to your discs. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

M35 - holds upto 40 discs M85 - holds upto 95 discs





PLASTIC LIBRARY CASES

FOR 51" DISC STORAGE holds 10 Discs.

£1.80

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use.

FR

DUST COVERS (For our Disc Drives)

Single (without PSU) £3.20 Twin (without PSU) £3.85 Single (with PSU) £3.95 Twin (with PSU) £3.90



Harness the full potentials of your Epson RX & FX Printers. Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ! (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

Look at the features:
Simply type *NLQ80/100 and a single VDU code to use NLQ print.

 NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.

program or language.

Single codes select PROPORTIONAL type (yes even on the RX80); ENLARGED type;
UNDERLINED type. These features can be used seperately or in any combination.

Full UK character set; Standard 'pica size';
Proportional spacing; Enlarged; Underlined;
Normal type.

The NLQ ROM is supplied complete with comprehensive manual.

P.S. NLQ ROM is compatible with the Torch Z80 system and can be used from within the Perfect Writer software.

Only: £25

VIEW PRINTER DRIVER for NLQ ROM

This specially written printer driver has been designed to allow View access to the full features of our NLQ ROM.

A must for all VIEW and NLQ ROM users.

£7.00

THE NLQ DESIGNER

KAGA KP810/910 and Canon PW1080 are two superb printers, as our many thousands of satisfied customers would surely attest to. One of it's particularly strong points is the NLQ option that it offers; perhaps one of the more weaker points is the effort required to design your own custom NLQ font.

Well the solution is here NOW in the shape of Watford's NLQ DESIGNER ROM! For the BBC Watford's NLQ DESIGNER ROM! For the BBC Micro. This powerful piece of software allows easy design and entry of a full NLQ font, with further fonts recallable from disc. Once a font has been programmed with the versatile NLQ DESIGNER, it can be saved to disc, downloaded to your Kaga (or Canon) printer, or even programmed into an EPROM (given the appropriate hardware) and then plugged directly into your printer, so that it is available. into your printer so that it is available immediately when you turn it on. Downloadable Fonts require 6264 RAM chip fitted.

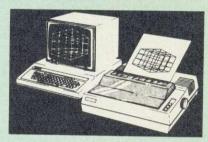
A 40/80 track format disc containing 3 example fonts is included in the package.

(P.S. This ROM is not suitable for Epson printers as they don't normally have NLQ ability. Keep reading our adverts though – work is in development!)

- NLQ Designer ROM & FONT Disc £25
- Kaga Individual FONT ROMs £15

(Write for further details).

DUMPOUT3



A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we

cannot replicate - if anyone can supply flashing

ink we would like to know!

The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest various includes a craphic dump time for the standard graphic co-ordinate system. version includes a graphic dump trigger for dumping screens from games whilst they are running.

Two commands are used to operate the dump

*GIMAGE - This provides a full graphics dump of any graphics mode, plus modes 7 and '8'. There are many optional parameters but you need only specify the parameters you wish to

Features available include:

- Vertical and horizontal scaling through all the
- graphic modes and mode 7
 Rotation of the image produced through 90, 180 and 270 degrees
 Left hand indentation setting
- Screen dump window definition Colour grey scaling Two tone fast dump

- Special colour mask Mode 7 contrast expansion Mode 7 contiguous dump

- Key triggered dumps User port switched dumps

What does the independent press say!

Practical Electronics, May 1985
"The Dump Out 3 ROM from Watford Electronics represents one of the most sophisticated types of printer dump utilities available for the BBC Micro . . . ".

an extremely sophisticated and powerful dump utility

"VERDICT - Dump Out 3 ROM has all the facilities which you are ever likely to need for producing printer dumps. The facilities available work extremely well and if printer dumps are something which you require, then this ROM can be recommended to help you to get the best out for your day are recommended. of your dot matrix printer

The Micro User Feb. 1985. "Well, here is that winner"

"provide(s) some rather sophisticated screen dumps. Producing high resolution paper copies of graphic screens in any (graphics) mode will be the major reason for buying this ROM, and this is where Dump Out 3 performs PAR EXCELLENCE". (Our capitals for their italics.)

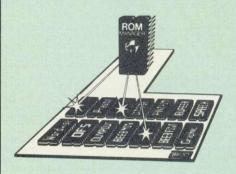
"The versatility of *GIMAGE (the graphics dump command) when using these parameters is amazing. Pictures of almost any size, shape, contrast or distortion may be produced without the need for a reducing photocopier or trick photography".

Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC micro. It is easy to use yet highly versatile, and caters for all BBC screen modes in multitone high resolution printing. Whole, partial, rotated and scaled screens may be dumped to almost any scaled screens may be dumped to almost any BBC compatible dot matrix printer (see our list at the end of this advert). At £25 it must represent excellent value for money and surely cannot be

Designed for use with the following printers:

CP80, GP80/100/250, CANNON, STAR KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, LPVII, NEC PC8023, DMP100/200/400, Mannesman Tally etc. Price including comprehensive manual

ROM MANAGER



Probably the most powerful way of expanding the BBC micro is from the use of Sideways ROMs. One problem faced by the avid ROM collector is that of ROM command clashes. The solution is very simple in the form of the ROM that "Provides comprehensive management of a your installed ROMs". (Quote from BEEBUG

your installed ROMs". (Quote from BEEBUG November '84.)
Basically, ROM Manager offers you the ability to turn off any installed ROM, or to send any * command to any specific installed ROM. It is said that imitation is the sincerest form of flattery – Acorn's BBC Plus features many of the abilities of this powerful ROM.

Many more facilities available.

SPECIAL OFFER £18

BEEBFONT ROM

BEEBFONT is a remarkable and different concept in BBC software. It allows you to display text on the screen in 13 different styles. It is supplied complete with a Spooler and Editor on 40 or 80

(Please write in for technical details).

ONLY £25

BEEB PRINTER ROM



This utility ROM is designed to simplify using all the facilities of your printer. It has many

Tacilities:

★ Selection of printer modes such as underline, font and size is by 'Single Key' operations.

★ From Wordwise, a single number following OC will select a mode rather than a long and incomprehensible string of control codes. This makes using your printer with Wordwise much

more convenient.

* When using Basic (or other languages) you ★ When using Basic (or other languages) you can have control over the formatting of the output to the printer in the style of a wordprocessor. You can define page top, bottom and side margins etc. with intelligent page skip for binders an option. All supported printers will now respond to form-feed etc. commands.

★ User defined characters are printed as you see them on the screen so that non-standard characters are automatically printed out correctly.

characters are automatically printed out correctly.

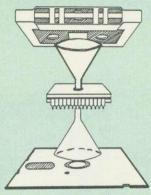
Commands select the options for the

★ Commands select the options for the following printers:
GP100, STAR, NEC, MX/FX, KAGA,
LP/VII/DMP100, DMP200.
Operates with either parallel or serial interfaces.
★ Supplied with a 50 page manual that is very comprehensive and easy to follow. Please specify printer type when ordering so that we can send the correct function key strip. the correct function key strip.

Price: £25

TRANSFEROM

(Tape to Disc Utility)



The only TAPE to DISC Utility ROM that works with our Double Density Disc Interface.

This advanced and sophisticated utility ROM for the BBC Micro has the following features:

- Fully menu driven for ease of use Copes with locked programs
- A very comprehensive built in copying features
- Copies very long adventure games Supplied with comprehensive manual

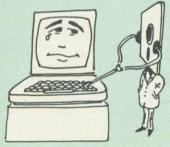
TRANSFEROM is now available in BOTH single and double density versions. The single density version works with both the Acorn and Watford single density DFSs. The double density version works with the Watford DDFS system only.

TRANSFEROM takes your software on tape and saves them onto disc. TRANSFEROM does not stop when one disc is full; you just insert another disc in and carry on with that one! Surely this is the most valuable investment you could make if you have tape software that you wish to transfer to disc! Please specify version required – Single or Double Density.

£25.00

All prices exclusive of VAT

DIAGNOSTICS DISC



The BBC micro is a very complex machine and thus diagnosing a fault can be very difficult. Until now, the only way to discover the nature of a fault was either to find a competent friend with a large degree of patience or to find your nearest dealer and pay him to find out what is wrong.

At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

Continued

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

ROMAS

THE CROSS ASSEMBLER AND **MACRO EDITOR** FOR SERIOUS PROGRAMMERS!



ROMAS is a carefully designed, sophisticated yet simple to use, development system for serious assembly language programmers. Using the BBC as the development system, you can choose your target system from the following processors:

.6502, 65C02, Z80, 8085, 8041, 6809 and Z8 P.S. This includes the Acorn 6502 & Z80.

ROMAS features a powerful expression analyser, making complex table easy to generate. To aid in documentation, fully formatted assembly listings may be produced, with full symbol table output

ROMAS is provided with a powerful cross referancer to produce a listing of all the labels in a given "source" program; this makes it easy to check to see if you are about to duplicate a label.

The Macro Editor

Features of this powerful editor provided with the ROMAS package include:

- Works in all 40 and 80 column screen modes
- Fast load and save speeds Continuous line and column number displays Search, replace and move; all available in
- Command repetition

The ROMAS package includes a comprehensive manual, providing detailed documentation and plenty of examples.

A give away at ... Only £45 Please specify 40 or 80 track disc when ordering.

ADE

'Systems' complete program development package in a 16K ROM. We are now supplying the new 6502 2nd processor compatible version.

SPECIAL OFFER ONLY £34

ULTRACALC 2

The mark 2 version of the BBC Publications extremely popular electronic spreadsheet ROM.

Only: £66

THE INVESTIGATOR

This sophisticated Utility program on disc, enables you to make security back-up copies of most of your valuable Disc Software. Makes full use of all 8271 (will not run with double density DFSs) facilities to discover the precise format of your protected disc so that an exact copy can be produced. Supplied with detailed instructions Please specify 40 or 80 track disc when

Only £20

ROM-SPELL

"way ahead of any competition"



ROM-SPELL is probably THE most advanced and fastest spelling checker available for the BBC Micro. Printed below are some extracts from a recent independent review (A&B Computing Nov. 85), which we feel sure will convince you that this is THE only spelling checker worth

considering.
"The editing system is very neat and simple, instead of replying to queries and beeps all of

"The other feature which places ROM-SPELL way in front of any competition is the ability to examine the user dictionary, so any spelling mistakes that have found themselves on the disc

can be examined and taken out if necessary".

"... that it is compatible with many of the popular word processors on the market is a good indication that ROM-SPELL is going to be a very

indication that ROM-SPELL is going to be a very popular product indeed".

"... ROM-SPELL is by far the best spelling checker for the unexpanded BBC B (with or without word processor). It boasts features which are hard to find on conventional spellcheckers on CP/M and MSDOS, namely Spellstar and has a speed/performance ratio of roughly the same as its CP/M cousin. The difference is that the CP/M version would cost the best part of £500".

"... and with such vital house keeping features as an ambiguous word checker, the ability to edit the user dictionary, a comprehensive manual that

the user dictionary, a comprehensive manual that is both easy to read and actually ENJOYABLE to learn from, . . . I feel confident that ROM-SPELL will woo the word processing public with no problems at all'

Don't settle for less, Buy the best.

ROM-SPELL costs only £25

(Please state 40 or 80 track disc)

REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be

£13 (40 or 80 track)

BEEBMON

BEEBMON is the most powerful and versatile machine code monitor from Watford Electronics. BEEBMON offers some superb features specially designed to make the task of understanding and debugging machine code easier; indeed BEEBMON is probably the only product with sufficient power to aid in the debugging of such complex pieces of software as a DFS. Offering a total emulation mode, BEEBMON can be used to single step through code anywhere in memory. All breakpoints are emulated and the workspace is totally relocatable, allowing for the simulation of all those "awkward" pieces of (Write in for technical details.)

£24

DISASSEMBLER ROM

Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use progammers tool.

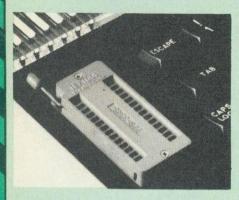
Please write in for technical details.

ONLY £16

Continued-



SIDEWAYS ZIF SOCKET



Now Watford Electronics brings you a ROM board for small budgets or for those of you who do not wish to open up your Micro frequently. It allows you to change ROMs quickly and efficiently with the minimum of effort — no screws to loosen or keyboard to remove. The unit consists mainly of a zero insertion force (ZIF) socket on a small circuit board which is located into the position of the 'ROM Cartridge' and is connected to one of the internal ROM sockets via a ribbon cable. via a ribbon cable.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the keyboard, unlike other cartridge systems. In addition, there are no costly extras, such as ROM cartridges for every new
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage. static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)

ONLY £15 (carr £2)

16K Sideways RAM Modules

This is it! The revolutionary design RAM Module you've been waiting for. Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM

Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
 May be fitted in systems even with a ROM
- Multiple units may be fitted, even with a ROM board.

- ROM board.

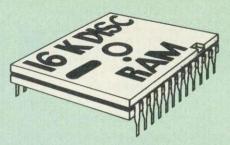
 No overheating or overloading problems.
 Free utilities disc supplied.
 Can be used as a 16K PRINTER BUFFER.
 Works with any ROM.
 Ideal for professional software development.
 Supplied with utilities software disc.

Only: £29 (carr £2)

Optional extras

READ and WRITE protect Switches 62 each Battery for Battery Backup 53

All prices exclusive of VAT



This is the RAM you've been waiting for!! This battery backed up, write protectable 16K sideways RAM board allows you to run from disk every sideways ROM available. Beware of other sideways RAM boards which are not backed up as certain ROMs will not run in these boards even though the RAM can be write protected. The Battery Backup facility allows retention of DATA after power off. On switch on the Micro DATA after power off. On switch on the Micro will think the WATFORD DISC RAM is a ROM Features available are:

- No soldering or modifications to BBC micro necessary.
- Plugs into normal ROM socket fitting neatly under the keyboard allowing room for other add-ons.
- add-ons.

 Easy to use. Comes with disk based software to SAVE and LOAD ROMs. Allows you to make backup copies of your ROMs.

 Disk software can be copied onto other discs when disc is full.

 All existing ROMs can be stored on disk and used in DISC RAM.

 No messy plugging and unplugging of your ROMs. Simply Load the one you want into DISC RAM.

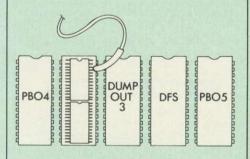
- Ideal for Professional users to develop ROMs. Backup facility allows testing of final versions without using EPROMs.
- The switch provided allows backup and write protection to be switched off externally. Can also be used as 16K printer buffer RAM in conjunction with our Buffer & Backup ROM.

New Low Price: £30 (carr £2)

P.S. 16K DISC RAM Board is not designed to work in conjunction with a Sideways ROM Board

SOLID STATE 16K SIDEWAYS RAM



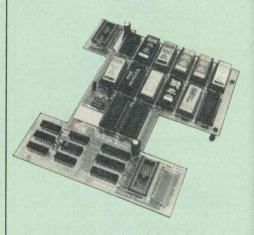


This new unit from Watford, which utilises the latest in Static RAM technology, offers 16k of easy-fit sideways RAM in a very compact unit with a footprint no larger than a standard 28pin EPROM. With only a single flying lead terminating in a mini hook-on probe, to fit, (no soldering required) this compact unit works with any BBC Micro with or without a ROM board. Compatible with BBC B Plus. Like our other 16K RAM Modules, this unit is very simple to fit.

Only £28 (carr 2)

Supplied complete with comprehensive software on Disc, Operating and fitting instructions.

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16. Also permissable, are various configurations of RAM (up to 16k) and different sized EPROMs (see below).

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are

- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows: Increase your BBCs capacity for ROMs from 4
- No soldering required.
- Very low power consumption. Minimal space required.

instructions

- Minimal space required.
 Compatible with Torch, DDFS, RAM Card,
 2nd Processor, etc.
 Socket 14 can take the following chips:
 2716, 2732, 2764, 27128, 6116, 6264.
 Auto write protect for RAM chips.
 Read protect to make RAM "Vanish"; allows
 recovery from ROM crashes.
- Battery backup option for RAM chips. Supplied ready to fit with comprehensive

Price: Only £32 Battery backup fitted £36

(carriage £2)

EXTERNAL Sideways ROM BOARD

This extremely versatile 12 ROM Socket Board is supplied with power supply, boxed in an attractively finished BBC beige. A second board can be fitted at a later stage to give a total capability of 28 ROMs.

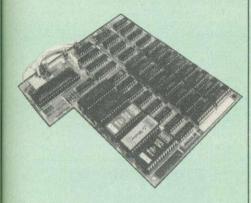
- No soldering required. Easy access to ROMs. Does not physically interfere with other internal add on boards.

- Built in power supply.
 Write protect for RAM.
 Allows upto 32K Static RAM and 24 ROM Sockets in varied combination.

Price: £75 (carr £3) (2nd Add-on Board £30)

Watford ROM/RAM CARD

A must for all serious users



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated hoard represents the versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
 No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers,

- Fully buffered for peace of mind. Firm mounting in BBC micro. Compatible with ALL BBC micros (not BBC
- Plus).

 Total number of ROMs increased from 4 to 8.

 Up to 8 banks of sideways RAM (dynamic).

 Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).

 Write protect for ALL RAM.

 Master write protect for all sockets.

 Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).

 Separate RAM write register (&FF30 to &FF3F).

- Automatic write to currently selected RAM socket for convenience.
- Can run ANY BBC ROM.
 FREE utilities disc packed with software.
 Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Card, Delta Card, Sideways 21F, etc.

 Large printer buffer.

 UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).

 ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD & 7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MICH. that looks like a disc but loads and saves MUCH

faster.

The ROM/RAM Board plugs into the 6502
CPU socket. This leaves free all the existing
ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC
micro's own ROM sockets may be used in the
ROM/RAM Board.

The ROM/RAM Board is supplied with all
ordered options fitted as standard. Upgrade kits
(with full instructions) are available for all of the
options, should the user wish to upgrade in the
future. Please write in for further details. future. Please write in for further details

INTRODUCTORY PRICES:

- ROM/RAM card with 32k dynamic RAM
 ROM/RAM card with 64k dynamic RAM £45 £69
- ROM/RAM card with a massive 128k dynamic RAM £109

(carriage on ROM/RAM Card £3) **OPTIONAL EXTRAS:**

- 16k plug-in Static RAM kit £7 Battery backup £3
- Read and Write protect switches £2 each Complete ROM/RAM board (all options installed) £125

Le Modem



The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200 supported

The features that make Le MODEM such good

warde are:

• A complete communications terminal that transforms your BBC Micro into a very powerful World/wide data transfer system.

• Auto Dials, Auto Answers, Auto Baud selects

and is completely controlled by your Micro. There are no external controls!

are no external controls!

• Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICROLIVE (BBC TV database), CITY BB and more.

• Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.

the rest.

Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELESOFTWARE to be downloaded.

A comprehensive 80 column terminal. This includes XMODEM error checked transfer

includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!

FULLY controlled by simple "COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!

Connects to the 1MHz bus. A "AUDIO ON/OFF command allows you to actually hear the telephone line through your BBC micro.

the telephone line through your BBC micro

loudspeaker.

Completely self contained with internal mains power supply. (Even a free mains plug is fitted!)

A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.

Packaged in such as way that you need nothing else except a BBC Micro to

communicate with computers all over the world.

• FREE 3 months subscription to Micronet and free registration to MicroLink to start you up.

BT Approval applied for.

PROHIPTED from

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual) (Write in for further details)

Nightingale Modem

SPECIAL PRICE to our Customers

(carr £3)

(Price includes: Nightingale Modem, Commstar ROM pack, Cables & Comprehensive manual)

Only £99 Nightingale Modem without software COMMSTAR ROM package only (P&P on modem £2.00) £29

Auto Dial/Auto Answer Board Auto Dial Utilities Disc OBBS Bulletin Software £20.00

LOGOTRON LOGO

The popular Logotron Logo in ROM.
Recommended by most Education authorities. Only: £55

ISLAND LOGIC MUSIC SYSTEM only: £25

Viglen Console Unit

Enhance the appearance and convenience of your BBC Micro with the Viglen console unit.

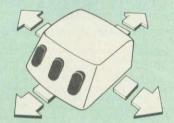
£42 (carr. £4)

GLENTOP's 3D GRAPHICS

Development System £22

THE AMX MOUSE

The AMX Mouse needs no introduction. It is simply the best.



Now supplied with the NEW SUPERART Software ROM & Disc at no extra cost.

ONLY: £65 (carr £1.50)

£20.00 AMX DESK Package AMX UTILITY Package £12.00 AMX SUPERART Package £43 AMX PAGE-MAKER Pack £43 AMX 3D ZICON Disc £21 **AMX Database Disc** £21 AMX XAM Educational £21

Versatile BEEB SPEECH SYNTHESISER Unit



The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive

SPECIAL PRICE £32 (carr £2)

Continued-

£9.50



COMPUTER CONCEPT'S ROMS

ACCELERATOR	£51
CARETAKER Basic Utility	£27
Graphics ROM	£25
Disc Doctor ROM	£25
TERMI	£27
COMMUNICATOR	£58
SPEECH ROM	£26

Wordwise

Special Offer:

£28

Wordwise plus

We are giving away absolutely FREE, the superb Word-Aid ROM worth £20 with every WORDWISE PLUS package bought from us.

Word-Rid The most comprehensive

utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses. Text transfer options.

- Chapter marker.

 Chapter marker.

 Search and display in preview mode.

 Embedded command removal.

- Print Multiple copies of a document.
 Multiple file options for print and preview.
- Address finder
- Label printer.
- Mail-merger. Number/delete/renumber.
- Clear text/segment area.

Only £20

(N.B. Word Aid requires a Disc Interface in your

HI-WORDWISE-PLUS

Supplied on disc. This version requires a WORDWISE-PLUS ROM to be present in the machine. It gives up to 44k of text space on the 6502 2nd processor.

£5

Inter SHEET

The most powerful spreadsheet package available for the BBC Micro. Ultra-fast replication and calculation times help make this the easiest to use. It has received very favourable reviews. Unique 105 column screen mode. Supplied in 2 ROMs.

This unique program is the only one of its sort on the market. Accepts data from a variety of sources and plots line graphs, bar charts or pie charts. Up to 16 separate charts may be stored in memory. Built in screen dump for EPSON compatible printers, but can use other printer dump routines

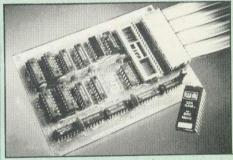
ONLY: £28

GRAPH PAD

With this popular Mk II British Micro's Graph Pad, you can add new dimensions to your computer enjoyment. It helps you to create your own applications programs by the simple use of the Graphpad. Ideal for educational use. Supplied complete with cables, Manual and Software

Special Offer £51 (carr £3)

32K SHADOW RAM-**Printer Buffer Expansion Board**



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.
- "VIEW" Wordprocessor users can now type in text in 80 columns and have up to 28,000 bytes free 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS). preview in 80 columns with the full 24K of text in memory. This superb product is recommended by Computer Concepts for use with both Wordwise and Wordwise Plus. We wholeheartedly agree with this commendation.
- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.
- Use 12K of the expansion RAM as PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Only a 12K printer buffer can be used in Wordwise or Wordwise Plus due to the way in which they are written. Print large text files while running long graphics programs and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Only 12K Buffer

can be used in Wordwise or Wordwise + because of the way these softwares are written.

- Ensure COMPATIBILITY with a vast range of hardware (including Watford & ATPL ROM boards, double density boards, second processors), and software (including BASIC, TOOLKIT, VIEW, WORDWISE (1.20+), WORDWISE-PLUS). This is because our board, unlike those of our competitors, is connected to the computer by a ribbon cable.
- Achieve EASY OPERATION with ROM based software. A large range of commands is available for machine code and BASIC users, including some useful *HELP messages.

Only: £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

INCREDIBLE WORD PROCESSING DEAL !!!

Watford Electronics, already renowned for quality products at discount prices, are

offering, for a limited period only, the truly spectacular BARGAIN OF THE YEAR! A Watford's 32K RAM Card (offering printer buffering and shadow screen RAM facilities) with the well known WORDWISE PLUS Word processor.

32K Shadow RAM Card/Printer Buffer and Wordwise Plus (a very powerful package) for the absolutely astounding

Only £75 (carr £2)

(P.S. For an extra £14, we will include Word-Aid ROM package for the Wordwise Plus, if bought at the same time.)

VIEW

VIEW WORDPROCESSOR 2.1 £39

VIEW 3.0 ROM

with a 6502 second processor and takes full advantage of any shadow memory fitted. BBC B Plus compatible. Supplied complete with Printer Driver Generator tape.

Price: Only £60

HI-VIEW

A special version of VIEW designed for use with 6502 2nd Processor. Available on disc, it offers 47K of text memory.

£38

VIEWSHEET (Acornsoft)

£39

VIEWSTORE

£39

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Watford's own Sophisticated VIEW PRINTER DRIVER for Epson FX80 & KAGA KP

Only £10

VIEW DRIVERS FOR JUKI & BROTHER PRINTERS Only £10

VIEW/VIEW SHEET PRINTER **DRIVER for SILVER REED** (Officially approved by Silver Reed)

Only: £10

OMNIREADER

OCR at a price you can now afford

The manually operated omnireader is preprogrammed to read 4 common type faces – including: KAGA Courier 10, Courier 12, Letter gothic & Prestige Elite. It reads a line of text in about 3 seconds & is ideal for inputting already typed material into wordprocessor packages, such as View or WW, Databases or Spreadsheets. Comes complete with power supply, instruction manual, longrule & Dustcover. Also available on disc for the BBC is a utility program which merges input from the service nort with the keybeard the allowing full editing. port with the keyboard thus allowing full editing control whilst using the omnireader. Also included is a Basic program which displays the pixel map image obtained from the omnireader ideal for doing your own OCR.

(As seen on the TV programme Micro LIVE)

Price: £175

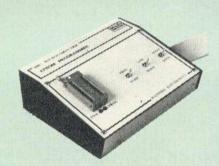
All Prices Exclusive of VAT

BOOKS (No VAT on Books)

BOOKS (No VAT on Bo	oks)
21 Games for the BBC Micro	£5.95
30 Hour BASIC (BBC Micro) 40 Best machine Code Routines	£7.95
6502 Assembly Language Program	£7.95 £19.95
6502 Application	£11.95
6502 Assembly Language Subroutines	£19.95
6502 Development System	£7.50
68000 Assembly Lang. Programming	£19.95
A Young persons Guide to BBC Basic	£5.95
Advanced Disc User Guide	£14.95
Advanced BASIC ROM User Guide Advanced Machine Code Technique	£9.95
for BBC	£7.95
Advanced Programming for the	
BBC Micro Advanced User Guide for	£6.95
BBC Micro	£11.95
Advanced Graphics with BBC Assembly Language Programming	£9.95
BBC Micro	£11.50
Advanced Programming Technique	
for the BBC Micro Adventure into BBC BASIC	£8.95 £6.95
Applied Assembly Lang. for BBC	£7.95
Assembler Routines for the 6502 Assembly Language Programming	£7.95
BBC Micro	£8.95
Assembly Language Programming	on the
BBC & Electron Basic ROM User Guide	£8.95 £11.95
Basic User Guide for BBC Micro	£10.00
BBC B+ User Guide	£14.95
BBC BASIC BBC Forth	£5.95 £7.50
BBC Machine Code Portfolio	£7.95
BBC Micro add on guide	£7.95
BBC Micro Advanced Reference Guide	£10.95
BBC Micro Advanced	
Programming BBC Micro Book BASIC Sound &	£9.95
Graphics	£7.95
BBC Micro ROM Book BBC Micro ROM PAGING System	£9.95
Explained	£2.00
BBC Micro Disc Companion	£7.95
BBC Micro in Education BBC User Guide	£6.50 £10.00
BBC Wargaming	£8.95
BCPL User Guide	£14
Business Applications on BBC Complete FORTH	£7.95 £6.95
CP/M - 86 User's Guide	£19.95
CP/M Bible CP/M Handbook with MPM	£16.00 £9.95
CP/M Plus Handbook	£13.95
CP/M Soul of	£14.95
CP/M The software BUS Creative Animation & Graphics	£8.95 £7.95
Creative graphics on BBC Micro	£7.50
Disc Drive Projects for Micros DISC FILING SYSTEM (DFS)	£5.45
Operating Manual for BBC	£6.95
Disc Programming Techniques	£7.95
Discovering BBC Micro Machine Code Disc System for the BBC Micro	£6.95
Exploring FORTH	£6.95
Filing System & Databases	67.05
for the BBC Micro FORTH on the BBC Micro	£7.95 £7.50
Functional Forth for the BBC Micro	£5.95
Games BBC Computer Play Graphics for Children	£6.95 £6.95
Graphs & Charts on BBC Micro	£7.50
Guide to BBC ROM	£9.95
Hackers Handbook Hackers Handbook - New	£4.95 £6.95
Handbook of Procedure & Function	s for the
BBC Micro	£6.95
Interfacing & Robotics on BBC Into View	£7.50 £4.50
Introduction to COMAL	£9.50
Introduction to LOGO Introducing CP/M on the BBC Micro	£6.95
2nd Processor	£9.95
Introducing LOGO	£5.95
Introduction to FORTH Introduction to PASCAL	£8.95 £16.50
ISO -PASCAL Reference Manual	£9.95
Let your BBC teach u to program	£5.45
LISP LISP, A Beginners Guide to	£11.95 £10.95
Logo Programming	£9.95
TOTAL TENENT VENEZA	TABLE

Mysteries of DISC DRIVES and	
REVEALED	£5.95
Mastering CP/M	£17.95
Micronet Handbook	£6.95
Programming the 6502	£13.95
Programming the BBC micro	£6.95
Programming the Z80	£16.95
Sencing & Control Projects for BBC	£5.95
S-PASCAL on BBC Micro	£7.50
Structured Prog. with BBC BASIC	
	£6.50
Termulator Manual	£4.95
The Complete FORTH	£6.95
The Complete Programmer	£5.95
The Epson FX/KAGA PRINTER	
Commands REVEALED	£5.95
Turtle Graphics on BBC Micro	£7.50
Using Floppy Discs with BBC Micro	£5.95
View Guide	£4.50
Viewsheet User Guide	£10
Using BBC Basic	£6.95
Wordstar & CP/M made easy	£7.45
Wordwise Plus Guide	The Control of the Co
	£9.95
Z8000 Assembly Language	
Programming	£18

EPROM PROGRAMMER



The Watford Electronics' EPROM programmer for The Watford Electronics' EPROM programmer for the BBC micro is a high quality self contained package. Programs all popular EPROMs from 2K to 16K: 2716, 2516, 2532, 2564, 2764 and 27128. All manufacturers' specifications have been followed to program EPROMs at the correct speed – wrong timings could destroy your EPROMs. The unit has its own power supply so does not put heavy loads on the BBC power supply as do some other units. Connects directly to the 1MHz bus following all Acorn recommendations on addressing and bus recommendations on addressing and bus

SOFTWARE PACKAGE

SOFTWARE PACKAGE
The software is supplied on an EPROM which plugs into the Micro and is instantly available with a single command (no time wasting as on Cassette/disc loading). It is a fully purpose designed and ingegrated package to simplify ROM development. The system is menu driven with many prompts to avoid any accidents.

Software facilities include:

Load File - Save File - Down Load EPROM - Program EPROM - Verify - Blank Check -Editing of memory contents prior to

programming.

Also included is an automatic system to allow Basic programs to be put in EPROM and accessed through the *ROM filing system. More than one program may be put in an EPROM. All these facilities and more are explained in the comprehensive and clear 15 page manual.

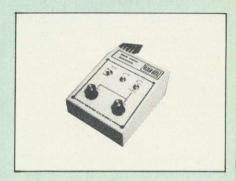
SPECIAL OFFER £69 (£3 carr.)

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- ERASER EB Standard version erases up to 16 chips £28 (carr £2)
- ERASER GT Deluxe version erases up to 28 chips. Has automatic safety cut-off to switch off the UV lamp when opened. £30 (carr £2)
- Spare UV tubes

BEER VIDEO DIGITISER



Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package is designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROM's to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image.

Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£110 (Carr. £3)

(Price includes: Digitiser Unit, Software in ROM & a Comprehensive Manual)

Magazine Maker

A combination of the AMX Pagemaker and Watford's Beeb Video Digitiser.

Using any video that provides a composite signal and the digitiser, images from a camera or TV can be converted into a graphics screen on the BBC Micro.

They can then be used within AMX Pagemaker

o illustrate magazines or newsletters – in fact anything that needs to be created on A4 size paper. With Pagemaker's many features, a variety of pictures can be composed – the only limit being the imagination.

Pictures can be doctored using Pagemaker's graphics option to produce any number of effects
Text can be formatted around the digitised

Text can be formatted around the digitised photo on screen using the facilities available, which include 16 typefaces, character and pattern definer, text formatting and the ability to load in wordwise and viewfiles plus much more. Once created the picture can be printed out. The Magazine Maker is suitable for any use that requires illustrated documents.

Complete Package £129.00 (carr. £3)



DATAGEM

Now compatible with Watford DFS's

Long hailed as the most comprehensive and powerful database for the BBC, and now becoming a legend in its own right, DataGem has been significantly reduced in price now that development costs have been recovered by Gemini. Whether you have a single 40 track drive or a Winchester hard disk, this system will make use of ALL your disk space, treating up to 4 drive surfaces as ONE CONTINUOUS FILE. Much has been made and exploited of DataGem's superb selective searching capability, and together with its unmatched mathematical powers, the system provides a really professional database for use in the home, office or school that will harness the full power and potential of the BBC micro.

AMATEURS & PROFESSIONALS

For newcomers to databases as well as seasoned For newcomers to databases as well as seasoned users, DataGem represents an ideal starting point. Structuring your file and layout couldn't be simpler using DataGem's on-screen 'painting' format. You can have up to 62 fields or data items wherever you want them on a scrolling 120 x 120 card. Colours are all definable, and field data and field titles may be separated if field data and field titles may be separated if required. Data entered may be stored in up to 8 tiers or 'levels', as well as within the whole database file. Scan one level or the whole database for records that match your search parameters, and place them in another data level for later manipulation. DataGem also boasts limited freelities for producing data merced. limited facilities for producing data merged letters, and may be configured as a 62 cell spreadsheet.

£49

L.B.O. Rom

Life & Business Organiser the ULTIMATE BBC utility!

This is a comprehensive life and business organiser package in 100% machine code which has been very carefully designed to provide a wide range of useful facilities for the busy person at home or in the office, and is simplicity itself to use. Once you start using LBO, you'll ALWAYS use it — not like one of those ROMs you only occasionally call on. LBO will put an end to forgetfulness and ensure that your time is organised, you know what you have to do and when, you don't forget bills or birthdays, and you are reminded constantly of urgent matters.

LBO was written by two graduates in Computer Science from Exeter University in consultation with a lecturer in Cognitive Psychology. It has been very cleverly researched

Psychology. It has been very cleverly researched and programmed and is confidently recommended by Gemini as a very superior program for the very superior BBC micro.

Features include:

- Automatic reminder of entries overdue for attention.
- One week's advance notice of forthcoming events.

- Urgent notice board. Creation of categories of entries; e.g. bills
- birthdays, letters to be written, notepad etc. Sorting of appointments by date and time of
- Month AND week's summary at a glance,
- indicating time booked and free.

 Single entry of a RANGE of events and updating of regular happenings.

 Super search facility to call any event by any related word or part word.

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(Cassette or Disc)

OFFICE MASTER



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- Final Accounts
- Mailist
- Easiledger
- Invoices & statements
- Stock Control

CASHBOOK - A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

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MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER - A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

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All this for only £21

(Cassette or Disc)

For fuller description on any of the software titles on this page, please refer to Gemini's own advert in this publication.

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The Revolutionary 'Triple-D' BBC Disk

Integrated Software System

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- Individually adjustable column widths with text overflow.
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- Full relative and absolute replication.
 Find and move to a row by name.
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 clock.
- clock Data spool option for merging with other files. FULL DATA COMPATIBILITY WITH 'DDD-BASE' AND 'DDD-PLOT'

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A 'Keyboard to Micro' replacement jumper lead.

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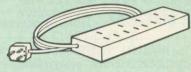
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Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further. section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

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The compact (90 × 80 × 40mm) UVIPAC EPROM erasers can handle up to 3 EPROMs at a time.

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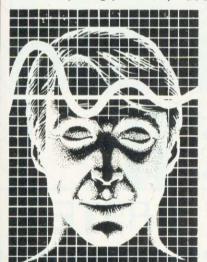
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The BIOGRAM software package includes: *RELAXOGRAM – a multi-level relaxation trainer and progress tester.

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'Excellent investment' Luton News

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FACILITIES INCLUDE:

- ★Up to 20 share names per portfolio per disk.
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mega-rom

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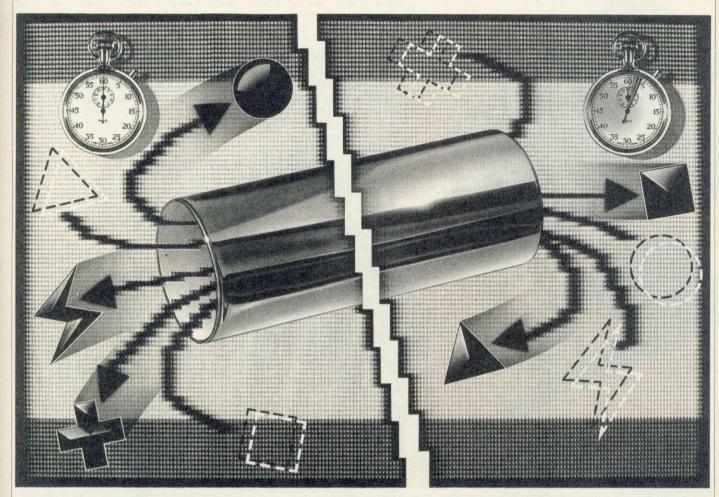
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IT'S QUICKER BYTUBE

Speed up data transfer across the Tube by including software in the BBC micro and second processor to enable them to communicate with each other

Martin Chaplin

his article forms the final part of a discussion of extensions to the 6502 second processor HiBasic. The first part, in March, described an improved and extended assembler to take full advantage of the more advanced 6502 chips now in use.

The 6502 second processor for the BBC micro is clearly a very useful addition to the system. It allows the use of a more powerful 6502 chip, faster programs and significantly more RAM. It is connected to the BBC micro through the Tube interface which allows both

microprocessors to share the work by running in parallel.

There are some fairly unsophisticated facilities provided for transferring bytes across the Tube which are documented in the user guide. OSWORD calls 5 and 6 allow the second processor to read from, and write to, the BBC micro motherboard, and OSBYTE calls &92 to &97 read from, or write to, the mapped input/output pages &FC, &FD and &FE. These calls, however, only transfer one byte at a time. Given the speed of operation possible for the Tube operation (up to 100,000 bytes/

second), this speed of transfer is miserably slow, at about 1500 bytes/second. So we need faster operation in both directions.

The programs presented here set up such a system and allow it to be incorporated into a Basic program by assigning the unusued keyword token &CE to the introduced keyword 'TUBE'. A complete mode 2 screen (20,480 bytes) can be transferred in just over 210 milliseconds in a Basic program. The CALL keyword function is also extended to allow calls to be made from a Basic program in the second processor to machine code in the

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BBC micro's RAM or paged ROM. The paged ROMs can be selected by an OSBYTE call (OSBYTE &A4 or *FX164), making use of a previously unused OSBYTE parameter.

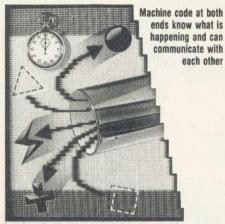
The problem with fast byte transfers across the Tube is mainly concerned with letting one end know what the other is doing! This is satisfactorily solved by including machine code at both ends which know what is happening and can communicate with each other.

Tube registers

There are eight Tube registers at either end, four are 'status' which indicate whether there is a byte waiting to be read (bit 7 set, =1) or transmitted (bit 6 reset, =0) in the adjacent 'data' channel. The status bytes are easily read by the BIT instruction followed by BPL (bit 7 tested) or BVC (bit 6 tested) branch instructions. The first pair of registers is reserved for OSWRCH calls (graphics and text), the second pair is used for other operating system calls (eg, OSBYTE and OSWORD), and the other two pairs for the filing system. The easiest pair of registers to use is the one used by the OSBYTE calls as this is checked regularly (up to 140,000 times/second) by the BBC micro.

The main byte transfer routines in my program use the unassigned OSBYTE code

164 (&A4). This entails sending a reason code (=6) followed by two data bytes and then the code (=164) to Tube channel 2. The reason code determines the jump address (&500 + reason code) in the BBC micro: in this case it jumps to the code for OSBYTEs greater than 159. The two data bytes are interpreted as the registers X and Y. The remaining data is sent



after this OSBYTE code. If this data is absent, the new code at the BBC micro end treats the call as a straightforward *FX164 call to check the presence of the code or change the ROM accessed (see later).

In either event, the data is redirected from the OSBYTE vector (&20A-&20B) to the

new code. After the byte transfer has been completed the second processor continues to execute its HiBasic interpreter and the BBC micro returns to its idler routine between &36 and &45 in zero page.

By choosing this rather indirect way of using OSBYTE &A4, the programs avoid notifying the second processor end of the Tube that OSBYTE has been used. If it was notified, it would annoyingly insist on waiting for the return byte which would both complicate and interfere with the byte transfer process.

Buffers

The buffers chosen for the programs perhaps need some comment. Locations &57-&8F in the BBC micro and &4F-&8F in the second processor are free in page zero.

The BBC micro has an extended character set which changes its PAGE to OSHWM + &5FF leaving the first free location as &1F00 (disc system) or &1400 (tape system). &1F00 is the address chosen for this program although other RAM may be used (eg, &A00) under certain circumstances.

The machine code at the second processor end has been put immediately below HIMEM, to enable it to be saved with the changed HiBasic, although again another RAM area

LISTING 1 PROGRAM NOTES: TUBE EXTENSIONS: SECOND PROCESSOR

This program (listing 1) should be run in the 6502 second processor under HiBasic.

The machine code generated is automatically saved, with the correct reload and execution addresses, as X_HIBAS in directory M. This code only operates with the code generated by the second program (M.IOTUBE) and may be run by:

*RUN M.IOTUBE < RETURN >

*RUN M.X HIBAS < RETURN>

160-170: Second Tube channel

190: &50 holds the direction of byte-transfer (= &FF, 2nd -> IO;=0, IO -> 2nd; =1, CALL code)

200: &51-&52 hold the address in the BBC micro

210: &53 holds &A4, the new OSBYTE code **220:** &54-&55 hold the number of bytes to be transferred

230: &56 holds 6, the reason code expected by the Tube for OSBYTE calls > &7F

240: &57-&58 hold the address in the second processor

300: evaluates an integer expression

310: cold start entry into HiBasic

320: gets next byte pointed to by (pointer), offset

330: continue HiBasic interpreter

400-440: code moved from HiBasic to make

way for Tube keyword entry

450-530: checks whether TUBEGET or TUBEPUT is being used. & A5 is the token for GET

610-640: discards unwanted letters

670-950: assembles addresses for Tube transfer from parameters in the Basic program line

750-810: fully tokenised TUBE ERROR message, ERR = &60

960: start of stand-alone code for fast BGET and BPUT

970-1080: send Tube parameters to the BBC micro

1110-1390: fast Tube transfer from the second processor to the BBC micro

1400-1650: fast Tube transfer from the BBC micro to the second processor

1660-1970: CALL extension to allow machine code programs to be started in the BBC micro. It transfers A,X,Y and C across the Tube

1690-1710: checks whether the CALL address is destined for the BBC micro (= &FFxxxx)

2000-2020: make room for 'TUBE' keyword in the keyword table

2030-2040: change the entry address into the keyword table

2050-2060: action address of the 'TUBE' keyword

2070: allow the 'TUBE' token (&CE) to be

recognised

2090-2130: insert 'TUBE' keyword, token and attribute into the keyword table

2150-2180: make room for 'TUBE' keyword in the keyword table

2190-2220: arrange jump for CALL keyword from HiBasic

2230-2280: sets new HIMEM

2320-2390: PROCsave; checksum and saves machine code. The checksum is correct for HIMEM set to &B800 (default) prior to running the program.

If only the fast BPUT and BGET routines are to be used, lines 250-330, 400-950 and 1660-2270 may be omitted. Then lines 90, 1390 and 2340-2380 must be changed to:

90 HIMEM = HIMEM - &73

1390 RTS

2340 FOR X% = HIMEM TO &B7FF

2350 sum% = sum% + ?X%

2370 IF sum% < > &48D8 PRINT"Check for possible assembly error"

2380 OSCLI "SAVE M.X_BGET"+STR\$ ~ HIMEM+ "B800" +STR\$ ~ HIMEM

The system will still recognise the new *FX 164 calls.

The M.IOTUBE program must be run to set up the BBC micro end of the Tube.

10

UTILITIES

may be more suitable. The fast Tube routines may be extracted from the HiBasic extension by omitting some of the assembly as outlined in the program notes.

There are two programs on the yellow pages to type in which set up the BBC and second processor (2P) at both ends of the Tube (listings 1 and 2). The specific details as to the use of the extensions to the HiBasic are set out in the program notes. There is also a test program, listing 3.

Additional Basic keyword

The keyword we add to Basic is TUBE, used as follows:

TUBEGET BBC_address, 2P_address, No_of_bytes

TUBEPUT BBC_address, 2P_address, No_of_bytes

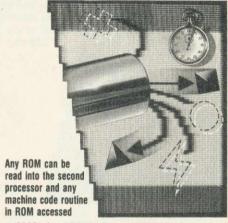
The new Basic keyword TUBE is used to transfer memory contents through the Tube. TUBEGET collects bytes (No_of_bytes) from the BBC (input/output processor) starting at memory position 'BBC_address' and places them in the second processor starting at '2P address'. TUBEPUT collects bytes (No_of_bytes) from the second processor starting at '2P_address' and sends them to the BBC (input/output processor) starting at memory position 'BBC_address'.

The 'TUBE command is tokenised (= &CE), as is the GET in TUBEGET. The minimum abbreviations allowed are TU.G and TU.P (TUBEG and TUBEP are also allowed). The syntax indicated above should be used.

The interpreter expects three numerical parameters after the TUBEGET or TUBEPUT command which must be separated by commas. Real numbers, hexadecimal

(prefixed by &) and variables may be used. There must be a space before the first parameter if it is a variable. If the instruction is incorrectly formulated a new error ('TUBE ERROR', ERR = &60) is produced.

A certain amount of care is needed in using these commands as they will corrupt the memory receiving the transferred bytes (&0000 to &2000 in the BBC and &0000 to



&0800 plus HIMEM to &FFFF in the second processor should be avoided).

CALL&FFxxxx is an extension of the normal CALL command. It allows machine code calls to the BBC if the address specified has &FF in its most significant byte of three. The A, X and Y registers and the carry flag are copied from the least significant bytes of A%, X%, Y% and C% and sent across the Tube to a machine code routine (set up by the user) at address &xxxx in the BBC micro. The CALL releases the Tube immediately, and allows both processors to execute independently. As the command USR uses the same code, it will not operate properly if the high address is used here. For example, PRINT USR&FFxxxx

returns the registers as entered without change, but does call the BBC program using these registers. Normal USR and CALL operations are unaffected.

New *FX call

The new *FX call has the following syntax:

*FX164

*FX164,X,Y

where X and Y are numbers. This is used for two purposes. As just *FX164 without parameters (or with any parameters except X = 1) it simply checks whether the appropriate code for these extensions is present at the BBC end of the Tube. If not present, the error 'bad command' (ERR = 254) occurs. If the code is present, no error occurs and &FF is returned in the X and Y registers.

If *FX164 is used with X = 1 (ie, *FX164,1,Y), the ROM in the socket indicated by Y (the ROM position) is selected (eg, *FX164,1,4 selects the ROM in socket 4).

With a ROM extension board up to 16 chips may be selected in this way. This call is mainly employed to select the memory used by the TUBE and CALL extensions.

Thus, any ROM can be read into the second processor and any machine code routine in ROM accessed.

This *FX call is not used by the operating system or DNFS, and is different from that used by the *Graphics* ROM (*FX162) and *Wordwise* ROM (*FX163) by Computer Concepts. The presence of the correct code at the second processor end of the Tube can be simply tested by checking that HIMEM has been changed.

Turn to yellow pages 106 to 110 for Martin Chaplin's listings

LISTING 2 PROGRAM NOTES: TUBE EXTENSIONS: I/O PROCESSOR

This program (listing 2 on the yellow pages) should be run in the 6502 second processor under HiBasic.

The machine code generated is automatically saved, with the correct reload and execution addresses, as X_IOTUBE in directory M. This code only operates with the code generated by the first program (M.X_HIBAS) and may be run as described above. Under no circumstances should M.IOTUBE be *RUN more than once without an intervening hard reset as it changes the OSBYTE vector.

160-170: second Tube channel

180-190: paged ROM registers

210: &60 holds the direction of byte transfer (=0, IO -> 2nd; = &FF, 2nd -> IO; =1, CALL code)

220: &61-&62 hold the address in the BBC micro

230: &63-&64 hold the number of bytes to be transferred

240: OSBYTE vector

310-390: set up OSBYTE intercept

410-440: check for *FX164,1,ROM_position: code that chooses the ROM to be read

500: checks for *FX164 calls

540-550: checks to see whether more bytes are coming down the Tube

560-610: replace the return address on the stack by the zero page address &36, the address of the DNFS idle routine

630-690: recover the remaining Tube parameters

730-990: BBC micro end of the fast Tube transfers from the second processor to the BBC micro motherboard: control returns to &36 after RTS

1000-1260: BBC micro end of the fast Tube

transfer from the BBC micro to the second processor

1270-1400: BBC micro end of the CALL extension: control returns to &36 after CALLed code has been executed

1300-1350: recovers the carry flag and transfers to the flags register

1360-1390: recovers the accumulator

1450-1520: PROCsave; checksum and saves the machine code. The checksum is correct for assembly at &1F00, the first free location after the extended character set has claimed its RAM.

If only the fast BPUT and BGET routines are to be used, lines 720 and 1270-1400 may be omitted. The checksum in line 1500 must be changed to &5CA4 for assembly from &1F00. The machine code name in line 1510 should also be changed to M.IOBGET.

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You can create amazing graphics using the Mandelbrot set technique — when you enlarge a minute area of a shape, more and more detail will be revealed

David Johnson-Davies

very so often an abstract mathematical topic captures the imagination of programmers to such an extent that thousands of hours of computer time are expended exploring it. Familiar examples are the search for larger and larger prime numbers in the early days of computers, and in the 1970s the programming of the evolution of cellular automata in John Horton Conway's game, *Life*.

One such topic currently arousing lively interest in computing circles is an object known as the Mandelbrot set.

The 'Mandelbrot set is an area in the twodimensional plane defined by the behaviour of a simple function when repeatedly applied to points in the plane.

The whole Mandelbrot set is shown as the black region in the plot of figure 1(a). The

coloured bands around the Mandelbrot set represent the behaviour of points as they get close to the set.

The great appeal of the Mandelbrot set lies in the complexity of its shape, which grows when minute parts of the region are enlarged and examined in greater detail. The figures in the two sequences of plots shown in figure 1(b) to (d) and figure 2(a) to (d) were obtained by exploring smaller regions of the Mandelbrot set. Each plot is an enlargement of the entire square area outlined in the previous plot of the same series.

In figure 1(d) a speck to the upper-right of the main Mandelbrot set turns out to be a miniature version of the whole set. In figure 2(d) a symmetrical whirlpool is revealed to have a tiny Mandelbrot set at its centre.

I'll describe the programs the BBC micro

used to derive these plots. The Mandelbrot set is named after Benoit B Mandelbrot who has studied it as one example of a class of objects whose appearance remains fragmented or irregular at any magnification. Such objects are known as fractals, and other fractals have already been described in articles in *Acorn User*.

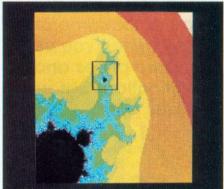


Figure 1b. Detail from main picture 1a

The mathematical interest in the Mandelbrot set is that complex and unpredictable behaviour results from the repeated application of a relatively simple function; the erratic and turbulent behaviour exhibited by this type of process may prove useful in modelling turbulence in physics.

Before looking at the function which gives rise to the Mandelbrot set, I'll examine a simpler function that behaves in an analogous way in one dimension.

A turbulent function

The following equations define, for a given starting value u, how the next term in the series should be obtained:

$$x_0 = 0$$

$$\mathbf{x}_1 = \mathbf{x} - \mathbf{x}^* \mathbf{x} + \mathbf{u}$$

The function is then repeatedly applied, or iterated, feeding the value of x back into the function to give a new value of x.

The iteration can be expressed by a Basic function FNt(u) as follows:

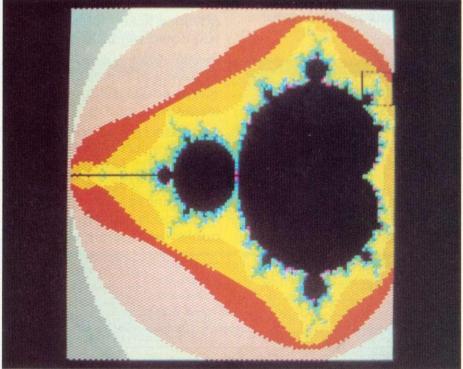


Figure 1. The Mandelbrot set (a) has infinite detail. If we zoom in on the small boxed area, the result is 1b, and so on . . . These pictures can be generated using the values from table 1 with listing 2

50 DEF FNt(u)

60 N% = -1:x=0

70 REPEAT x = x - x*x + u:N% = N% + 1

80 UNTIL N% = 255 OR ABS (x) > 100

90 = N%

The variable N% counts the number of iterations carried out for a given starting value of u. For some values of u the value of the function rapidly becomes very large; because of the x^2 term it is clear that as soon as the size of the function ABS (x) exceeds some criterion value, say 100, it will continue to grow without stopping. In such cases we count the number of iterations before this happens, eg, u = 2.4 takes seven iterations to exceed the criterion:

2.4, -0.96, 0.5184, 2.6497, -1.9710, -3.4561, -13.0004, -179.6111 and so FNt(2.4) = 7.

However, there is a set of starting values of u for which repeated application of the function never causes x to grow large. I'll call this one-dimensional set the 'T' set. For example, the behaviour for u = 2.0 is: 2, 0, 2, 0, 2, 0, 2, . . . etc.

The value of x cycles indefinitely. The behaviour of the function is followed for a convenient number of iterations, in this case 255, and so FNt (2.0) = 255. If this number of iterations is completed without the value of x exceeding the criterion, starting point u is defined as lying within the 'T' set.

The program TURB1 in listing 1 on the yellow pages plots the behaviour of this iterated function FNt(u) over a given range of values of u. It prompts for two numbers – the starting value to be plotted, x, and the range

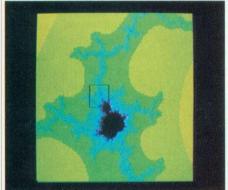
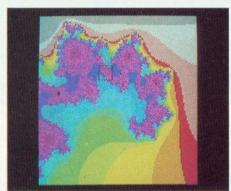


Figure 1c. Zoom in from 1b

over which the values should be examined, s. In other words, to plot the range u = 2 to u = 3 the values x = 2 and s = 1 should be given. The program divides this range into 256 points and plots the value of FNt on the vertical axis for each of these points.

The result of this plot is shown in figure 3. Values up to approximately u = 2.25 belong to the 'T' set. Beyond u = 2.25 the behaviour of FNt(u) becomes highly erratic. The number of iterations needed for the function to exceed the







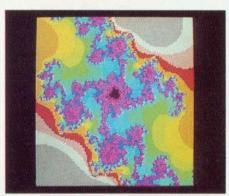


Figure 2. This sequence is yet another part of figure 1a. The fourth shot has a tiny Mandelbrot set at the centre of the 'whirlpool'. See table 1 for the values to generate these pictures from listing 2

criterion value varies wildly from one point to another close to it. The fractal nature of this function will be seen if you try plotting smaller ranges of values within the region of turbulence; for example, between u=2.3 and u=2.300001.

The Mandelbrot set

The iteration just described defines a set of points in one dimension. In a similar way, the Mandelbrot set is a set of points in two dimensions defined by a function in x and y when iterated with a given starting value. Stable starting points which when iterated remain small, are said to belong to the Mandelbrot set. Starting points which cause the function to grow rapidly are said to lie outside the set. The function which causes this behaviour is most simply defined in terms of complex numbers. The following description avoids the need for an understanding of com-

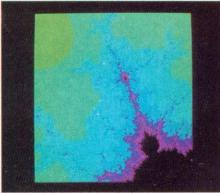


Figure 1d. Note the miniature Mandelbrot set!

plex numbers by giving the function in terms of ordinary arithmetic, as it would normally be expressed on a computer.

The Mandelbrot function of a point (u,v) is simply defined by:

 $x_0 = 0$

 $y_0 = 0$

 $x_1 = x * x - y * y + u$

 $y_1 = 2*x*y + y$

This can be expressed in Basic as a function FNm (u,v) as follows:

60 DEF FNm (u,v)

70 N% = -1:x = 0:y = 0

80 REPEAT v2 = v*v:x2 = x*x:

y = 2*x*y + v:x = x2 - y2 + u:N% = N% + 1

90 UNTIL N% = 255 OR x2 + y2 > 4

100 = N%

This time we use the distance of the point (x,y) from the origin as a measure of the size of the function. It is easily shown that as soon as the distance of (x,y) from the origin exceeds 2, the size of the function will then continue to increase rapidly with successive iterations. The entire Mandelbrot set therefore lies inside the circle defined by:

$$x^2 + y^2 = 4$$

and we can disregard points outside this circle, coloured grey in figure 1(a). In FNm (u,v) we therefore iterate until:

$$x*x + y*y > = 4$$

Again, we follow a point for up to 25 iterations. This maximum number of iterations was chosen so that the numbers will fit into one byte when they are to be saved to disc in

GRAPHICS

MANDEL2. With a higher value the boundary of the Mandelbrot set is slightly sharper, at the expense of longer calculation times.

Points for which FNm(u,v) = 255 belong to the Mandelbrot set, and are traditionally coloured black. The equally fascinating behaviour of points outside the Mandelbrot set can be shown by using different colours to represent the number of iterations before FNm(u,v) exceeds the criterion. We have seven remaining colours to assign to the 254 different possible values of FNm(u,v). The way that these colours are assigned will be crucial in determining the amount of detail that can be seen in the area surrounding the set.

There are two possible approaches to assigning these colours. The first is to calculate a fixed mapping of function values to colours,

X	y	S
1a -2.0	-1.25	2.5
1b 0.25	0.5	0.25
1c 0.34	0.63	0.04
1d 0.353	0.647	0.005
2a - 0.9	0.15	0.2
2b - 0.737	0.25	0.025
2c - 0.725	0.257	0.006
2d 0.7228	0.26055	0.0005

Table 1. The values needed to produce figures 1 and 2

and then use this mapping for all pictures produced for different parts of the Mandelbrot set. The advantage of this is that in a series of enlargements, such as in figure 1, successive pictures maintain the same colours for the same features in the plots. Also, the display can be built up as the picture is calculated.

The second approach is to calculate the value of the function FNm(u,v) for every point on a particular plot, and then on the basis of the values present in that plot assign the colours to give the desired detail. This approach was used to give the second series of four plots in figure 2 and a program using this method is given towards the end of the article.

Mandelbrot set program

The program MANDEL1 (listing 2), uses the first approach of assigning colours to points not in the Mandelbrot set to give a series of coloured contours using a fixed mapping function. It plots the points as they are calculated directly in eight colours within a square of resolution 128 x 128. Figure 4(a) to (d) shows a series of screenshots produced using the MANDEL1 listing.

The original program used the Acornsoft Graphics Extension ROM to give an additional eight shades consisting of mixtures of

white	red	yellow	green	cyan	blue	magenta	black
1-2	3-4	5-10	11-23	24-52	53-115	116-254	255

Table 2. Alignment of contour levels to colours for the eight colour version

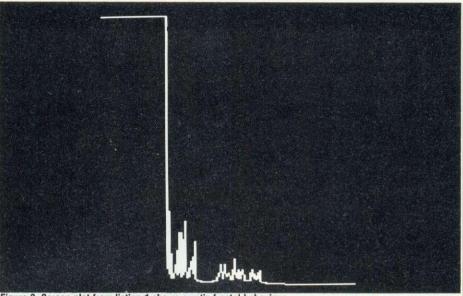


Figure 3. Screen plot from listing 1 shows erratic fractal behaviour

successive pairs of the eight standard colours. The version given here can be used to plot either with just eight colours, or with eight colours and eight shades using the GXR (or on a Master 128). The version of PROCgcol in lines 620-640 should be used for an eightcolour plot, with maxcol% set to 7 in line 60; for 16 colours the version of PROCgcol on lines 660-710 should be used, with maxcol% set to 15 in line 60. The 16 colour version works by setting D% and E% to the values of adjacent logical colours for odd values of B%, and to the same logical colour for even values of B%. The VDU statement in line 690 then sets up a shading pattern, which the GCOL statement in line 700 selects for plotting.

The program uses a rather unusual method of plotting the 128 x 128 points on the display so that a coarse lower-resolution view of the whole picture appears quite rapidly, enabling you to check that the desired part of the plot has been correctly chosen. Instead of plotting each of the pixels individually, starting at one corner and scanning the display, it 'tiles' the display, first with one 128 x 128 square, then with four 64 x 64 squares, then with 16 32 x 32 squares, each time filling the square with the colour of the pixel in the lower left-hand corner (lines 560-590). The test on line 530 ensures that each of the 128 x 128 values is actually only calculated once, so that the program takes just marginally longer than plotting individual pixels in strict sequence.

The main program begins on line 60. It first sets up a text window (line 100), and then prompts for the bottom left-hand point of the square to be plotted, x and y co-ordinates, and the length of the side of the square s. The entire

Mandelbrot set fits in the square with origin (x,y) = (-2, -1.25) and side s = 2.5. The plots in figures 1 and 2 were made with the values of x, y, and s shown in table 1.

For each point in the 128 x 128 area the program calls PROCpt which calculates the coordinates (x,y) of the next point to be plotted and calls FNm for that point. The value returned is then mapped to one of the screen colours by the array C%(1)...C%(255) whose elements are set to the values 0 to maxcol% to determine the mapping of function values to colours. PROCgcol is called to choose that colour for subsequent plotting, and a square is plotted at the screen coordinates X%, Y%.

The mapping function, found after much experimentation, is logarithmic and is given in lines. 130 to 160. The VDU statements in lines 170-220 reassign the physical colours to logical colours 0 to 7 to give a pleasing sequence of colours. The resulting assignment of contour levels to colours is given in table 2, for the eight-colour version.

Altering the contours

The assignment of colours to the 255 contour levels is a crucial process in achieving a good Mandelbrot plot; if too many levels are assigned the same colour, detail will be lost in the final plot. Conversely, if too many colour changes occur where the contour levels are changing rapidly, the display will be a blur of colour. The most flexible approach to plotting the Mandelbrot set and its associated contours is to save all the calculated points to a disc file; the assignment of the 255 contour levels to the more limited colours on the display can then be handled fairly quickly just by reading the points from the file.

The program MANDEL2 (listing 3) creates

such a 4k disc file of data; this time, the points are simply calculated in sequence and saved to the file without displaying them. As a measure of the program's progress, the column number J% is printed out for each of the 128 columns.

Plot data file

The program MANDEL3 (listing 4), reads the data file created by MANDEL2, processes the points, and displays the resulting plot. MANDEL3 first reads in the function values and counts the number of points for each value 0 to 255 in the array C%. It then assigns values to C% such that all function values with a value of 255 are plotted black, and the remaining 15 colours are each assigned to approximately equal numbers of points (lines 200-270). Finally in line 390 the random-access pointer is reset to the beginning of the file, and lines 400-490 plot the entire graphics display.

Again, two versions of PROCgcol are provided, and the appropriate version should be used depending on whether the *GXR* is available, with maxcol% changed to 15 in line 60 as necessary. Because of the large number of calculations needed for each plot, MANDEL1 and MANDEL2 can take between two and four hours to run to completion, depending on the range of values being explored. It is advisable to save a screen-dump of every successful plot for future reference, using for example *SAVE PX FFFF3000 +5000 typed in once the program has finished.

There are countless fascinating shapes waiting to be discovered in the vicinity of the Mandelbrot set; in fact, the infinite detail there

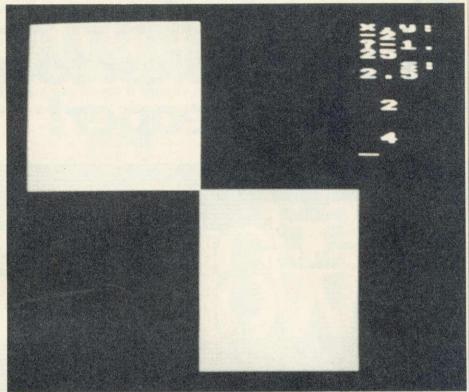


Figure 4. This sequence of four pictures demonstrates figure 1a being built up by listing 2. Note that the display for the number values is different in listing 2. (a) the start of a three-hour sequence

makes it certain that there are patterns which will go undiscovered forever. Readers finding particularly interesting regions in the set are encouraged to send them in to *Acorn User*, as screen dumps on disc. A review of the best plots will be featured in a future issue for the benefit of other explorers.

David Johnson-Davies' listings are on yellow pages 114 to 115.

The Mandelbrot set was the topic of the Computer Recreations column by A K Dewdney in the August 1985 issue of Scientific American. A fuller account of the function is given in The Fractal Geometry of Nature by Benoit B Mandelbrot, published by W H Freeman & Co. The concept of iterated functions is discussed in chapter 16 of Metamagical Themes by Douglas R Hofstadter, published by Viking.

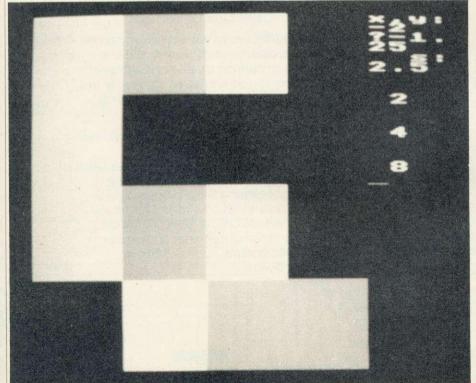


Figure 4b. After about 30 seconds

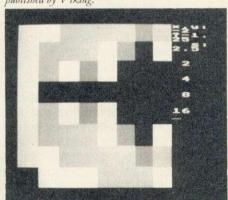


Figure 4c. Three minutes and the set can be seen

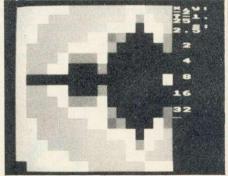


Figure 4d. Six minutes and detail starts

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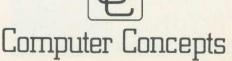
Embedded commands can be put into the text to control the overall page layout. These alter such things as the line and page lengths,

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WORDWISE works with all filing systems such as disc, cassette and the new ADFS. It works with any printer that is compatible with the BBC Micro (most are) and is able to control all the special features of the printer such as underlining, italics etc.

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DYDUMPING

Our printer expert provides a way for you to transfer user-defined characters to a printer automatically, and a printer dump program for character screens

George Hill

hint referring to the automatic transfer of user-defined characters on the printer (Nov '85, page 49) provided the motivation for coming up with a mechanism by which this can be done, and you'll find three programs on the yellow pages using the technique. The last of these is a printer dump program for character screens which is similar to the machine-code version of the *Acorn User UserDump* ROM. These listings will work on Epson and Epsoncompatible printers with double density graphics facilities such as the Citizen 120d, Star, Kaga Taxan, etc.

The function *CDUMP (character dump) on the *UserDump* ROM decodes the screen version of the characters, whether user defined or not, and produces a perfect printed image, independent of mode. Figure 1 shows an example. Listing 4 gives a sample screen using user-defined characters. It contains the procedure 'PROCreadparameters' which is also used in the dumping program to determine the current mode and set up the line-length and number of lines per page. This enables the program to run in any mode – though user-defined characters have no effect in mode 7.

The method of dealing with the characters depends on covering the eight 'horizontal' bytes per character of the Beeb's user-defined characters to eight 'vertical' bytes for the

Figure 1. Example screen in mode 2 dumped using listing 3 from the yellow pages

printer. This is possible, but unbelievably slow in Basic, and involves MOD and multiplication routines. Bit manipulation is much better accomplished in assembly language.

The machine code for doing this is assembled in DIM space in listings 1 and 3 and has

only minor modifications in listing 2 (added routines to read the character at the text cursor and to print the characters after translation).

The programs all place the ASCII value of the current character into a byte reserved for the purpose – 'char'. The routine (assembled at

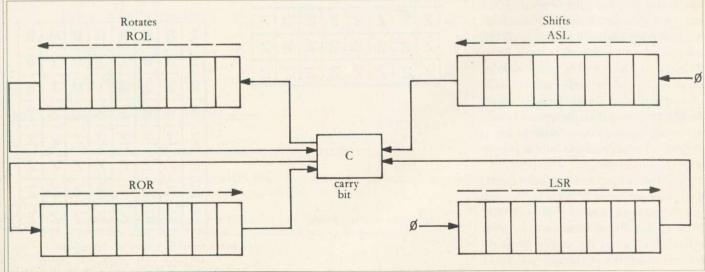


Figure 2. The 16 possible ways of dealing with bit transfers

PRINTERS

'code') first reads the character definition of this character by an OSWORD call, into eight bytes reserved for it, starting at 'cchar'. These are processed by 'htoy' into eight bytes for the printer, starting at 'pchar'.

The processing method depends on the fact that 'shift' and rotate' operations exist on the 6502 which shift bytes either left or right. In all cases the bit shifted out is transferred to the carry bit. In the rotate instructions the previous contents of the carry bit are shifted in, while in the shifts, a zero is shifted in. Thus the carry bit can be used as a temporary home for a bit which is then transferred elsewhere. There are 16 possible ways of dealing with bit transfers, illustrated in figure 2. The particular combination used in this transfer is:

LSR byte 1 ROR byte 2

This shifts the least significant bit of byte 1 into the most significant bit of byte 2. Byte 1 has zeros shifted in to the right-hand end, and the bits shifted out of byte 2 go to the carry, but are 'lost' in subsequent operations (figure 3).

The graphics/text program HTOV (listing 5) illustrates how the bit-by-bit conversion is carried out - it is an animated 'visual aid' which might be helpful to teachers in other contexts. The variable delay at line 160 gives a 10 second delay between moves. This can be altered, or individual moves caused, by using the space bar. Figures 4, 5 and 6 illustrate a set of character bytes and printer bytes before, during and after conversion. They are printouts from the HTOV program.

In listing 1, CHARPRT, single characters are prompted from the screen, either as their ASCII values or as characters, and their defined representations are printed. Figure 7 is a sample output from the program.

In TYPWRTR, listing 2, the printer reproduces exactly any text which is typed at the keyboard, using any character definitions you have altered. You can define Greek characters and type them in directly. If French accents are required, define them and type them in. You enter your text a line at a time, and it is shown on the screen (figure 8). The cursor 'sticks' at the end of the line, and beeps, just as it would on a typewriter. At the conclusion of editing the line (the Copy and Delete keys can be used as normal), pressing Return causes the line to be printed. The program runs in mode 3 giving an 80 character line length.

Note that the program allows all characters to be redefined, using *FX20,6, and so must run at &600 above the normal value of PAGE. If the value of PAGE seems too low for the current filing system the program is halted. You can change this by checking lines 240 to 290. If you have discs and the normal DFS

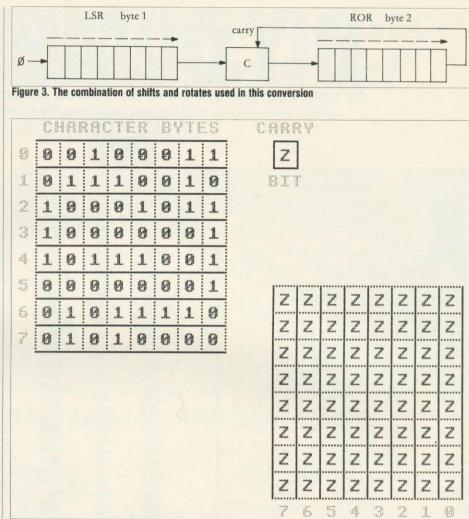
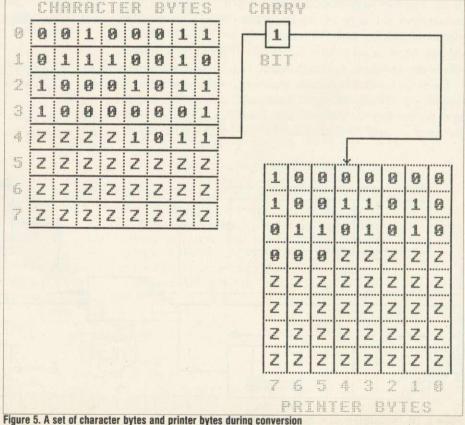


Figure 4. A set of character bytes and printer bytes before conversion



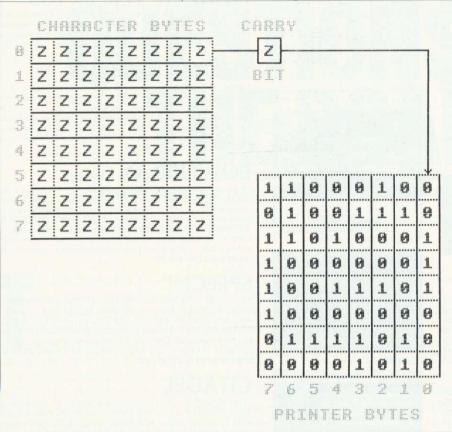


Figure 6. A set of character bytes and printer bytes after conversion

Type a character. ASCII code: A or ASCII code: B Type a character, or ASCII code: C or an ASCII code: 1 Type a character, or ASCII code: 2 Type a character, or an an ASCII code:: Type a character, or an ASCII code: * Type a character, or an ASCII code: 241 Type a character, or Type a character, or ASCII code: 242 an ASCII code: 240 Type a character, or an

Figure 7. Sample output of listing 1, the CHARPRT program

THIS PROGRAM ALLOWS YOUR BEEB + PRINTER TO ACT AS A TYPEWRITER.

You can redefine characters (notice the A has been altered), and type in a line at a time. They are printed when you press return.

If you redefine the characters correctly you can type in foreign characters. I have redefined some of the more obscure ones to use as French characters. Et maintenant je peux écrire en Français!! forêt, sûr, hâte, tôt, à, frère.

Figure 8. The TYPWRTR program, listing 2, reproduces text with any character definitions you have altered

chips, when the default value of PAGE is &1900, then simply prefix the program by:

1 IF PAGE < &1F00 THEN PAGE = &1F00:CHAIN"TYPWRTR"

Your desired character definitions can be carried out either externally by another program, or internally by altering PROCdefinechars (which currently only redefines A of the printing characters). I wanted to use another utility (DEFCHAR) to define the characters. To do this you must remove the *FX20,6 call, as this destroys any previously defined characters in the normal range.

Listing 3, CDUMP, is a procedure for merging with another program (for example the SPLSCRN program). It may then be activated by inserting:

PROCedump

where you want the dump to occur. You'll find instructions for carrying out program merging in the user guide.

CDUMP will work in any mode, but will not print any dots produced by graphics commands or any characters printed at the graphics cursor. PROCreadparameters is used to read information for the printer, as well as characters per line and lines per page. These parameters are used to control the printing of the prepared bytes in PROCdump.

PROCdump (lines 10480 to 10650) is explained line-by-line below:

10490	Restore	default	screen	and	enable
	printer				
10500	Set linef	eed on n	rinter		

10500	Set linefeed on printer
10510	Loop for vertical scan

10530 Read character at text cursor
$$(A\% = 135, \text{ line } 10770)$$

10000	TATALK T	U			
10640	Formfeed,	reset	printer	and	disable
	printer				

The conversion of CDUMP to a full machine code program to dump the graphics screen is largely a matter of doing arithmetic in assembly language and adding a print routine. This is relatively simple if you are into that sort of thing. If not, buy the very reasonably priced UserDump ROM!

George Hill's listings to dump user-defined characters are on yellow pages 110 to 114

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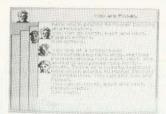
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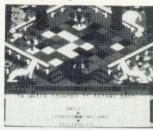
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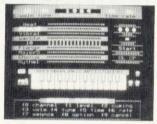
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QUESTIONS FOR THE BOARD

Choosing an expansion board to extend the capacity of your BBC micro or Electron is not easy. Here we answer your most common questions and summarise what the options are

Chris Drage

he BBC micro was not designed to accommodate extra boards despite being able to cope with 16 paged ROMs. Physically a 12-socket board takes up a great deal of space inside the machine, and any board covering the Beeb's RAM area is inviting overheating problems with the resulting corruption of memory. Picking up the lines necessary for operation can provide some soldering headaches, although many boards are now of a plug-in-and-go design. Perhaps the main factors to consider when choosing a ROM expansion board are:

- Ease of installation
- Reliability in operation
- Physical stability of the board
- Offers sideways RAM
- Compatibility with future expansion plans

The reviews which appeared in the April and September 1985 issues deal with most of these points.

Options

For the maximum number of ROMs, the Exprom, ATPL and Watford SSRB boards provide for 16 paged ROMs. I have extensively used both the ATPL and the Exprom boards and found them easy to install and reliable. Another system worth considering is the Computer Village CVX16-2, but this one's awkward to fit. If you wish to use sideways RAM to the full, then the Ramamp RA32 board scores well. Utilising 32k of dynamic RAM it represents a cost-effective means of combining sideways RAM and ROM expansions, but the number of ROM slots available is limited to 10. The Aries B12 is another well-constructed board. Its ease of installation and reliability, combined with the fact that it may be used with the Aries B32 shadow RAM board, makes it an attractive option.

Several manufacturers have opted for externally mounted boards. Perhaps the most cost-effective and simple ROM expansion system is

the excellent ROM-cartridge system from Viglen Computers (reviewed in AU October 1984), which enables you to utilise an unlimited number of ROMs safely, although if you have 30 ROMs it might be more expensive than a ROM board. I do not recommend the use of externally mounted ZIF sockets as the risk to valuable ROMs is too great. Other larger, external boards are produced by GCC (Cambridge) and HCR Electronic Services. If you want the best of external ROM sideways RAM expansion then both these systems are sure to please. Provided you have additional driver boards installed, each has the added bonus of being portable. The Micro Pulse Rombox is an elegant but expensive way to expand one ROM socket. With the purchase of additional leads, this system is also portable.

All the ROM expansion options above provide various solutions to the BBC micro's lack of ROM sockets. You will have to judge for yourself whether you are likely to make sufficient use of the facilities each offers to justify the cost.

The system for you

Many people expand the sideways RAM potential of their computers in preference to obtaining extra ROMs, and again we are spoilt for choice. I'll offer a few pointers and include

the summary and score tables carried in December. Any changes to the figures are the result of hardware improvements, updated software (in Solidisk's case), and price changes. In addition, I've included several questions which are typical of those *Acorn User* receives on the subject of sideways RAM.

Q I am a novice. I simply want to add 16k of sideways RAM to my machine.

A Of the boards reviewed the Ramamp RA16 offers reliability and the best value for money. Easy to fit, but more expensive, is *Acorn User*'s own UserRAM.

Q What is battery backup?

A Many ROM boards provide a facility for you to add a small Ni-Cad battery at a later date. This is charged by the computer and provides a means for sideways RAM to maintain its current ROM image while the computer is switched off. This is particularly useful for those who are developing their own sideways software. The reviews in the April and September 1985 issues refer to the boards which provide battery backup.

Q What is write protection?

A Several RAM boards provide the facility of a write protect switch (or allow you to add one). Once invoked, the switch prevents any writing to sideways RAM by the user or by the ROM image.

RAM Boards	Solidisk 32/64/128	HCR 16/32	Ramamp RA16	Acorn User User RAM	Watford 16k Module
Design	3	4	4	4	2
Construction	3	5	4	4	4
Ease of installation	1	4	4	5	3
Versatility	5	4	4	4	4
Software provided	4	3	4	4	3
Documentation	4	3	3	4	3
Value for money	4	4	4	3	3
Total (out of 35)	24	27	27	28	22

How the internal RAM boards score out of 35

COMPATIBILITY

viiiai N	RAM/ROM boa	Total ROMs	RAM		Installation	Cost	Software	Available from
	ROM	available	availab	le		Cost	provided	ANT MILMORE HOLL
ATPL	RAM/ROM	(socket 15 reserved for RAM)	16k as 2 CMOS static R Battery option	(6264) AMs.	Plug in	£38 + VAT (Battery backup £17+V	kits	ATPL, Station Road, Clowne, Chesterfield S43 4AB
Aries B12	RAM/ROM	(socket 0 reserved for RAM)	16k as 2 CMOS static R or 8k as 1 × 8k (RAM c	(6264) AMs CMOS	Plug in (can be mounted externally (CPU carrier board £5.75 extra)		N/A	Aries Computers, Science Park, Milton Road, Cambridge CB4 4B
Ramamp RA32	RAM/ROM	10	16k or 3 dynami on boar	c RAM	Plug in + 4 wires to solo	£59	10 utilities	Twillstar Computers, 17 Regina Road, Southall, Middlesex
Exprom	RAM/ROM	16 or 15 + 1 RAM position Wait states may be selected for slow EPROMs	to be m	(able	Plug in (may be mounted externally)	£59.95 (basic) £80.50 (fully expande	N/A d)	Anderson Electronics, 2 Hollin Park Road, Calverley, Pudsey LS28 5PU
Watford solderless ROM board	RAM/ROM	16	16k as 2 CMOS static R Battery option	(6264) AMs.	Plug in	£32 + VAT (Battery backup £38 + VAT		Watford Electronics, Jessa House, 250 Lower High Street, Watford, Herts
External R	ROM sockets	of the fact of the second			The section of	MALTINE		The state of the s
Viglen	Cartridge	N/A	N/A		Plug in	£15.95 Cartridg £2.95 ea		Viglen Computer Supplies Unit 7, Trumpers Way, London W7 2QA
External R Micro Pulse Rombox	ROM/RAM boa	8 (1 is a ZIF socket)	None		Plug in	£57.44	N/A	Northern Computers, Churchfield Rd, Frodsham Cheshire WA6 6RD
External ROM box	RAM/ROM board including own PSU	12 + 12 on optional second card	static R	sible as CMOS (6264) AMs. Also 16 RAM	Plug in	£80.50 (£33.35 second card)	N/A for	HCR Electronic Services, HCR House, Bakers Lane, Ingatestone, Chelmsford, CM40 B2
Ram/Rom 15	5 RAM/ROM	11 or 10 + 1 RAM position (plus 4 on BBC board)	backup several (separat	+ eable battery	Plug in driver board (main board external)	£100.79	6 utility programs	GCC (Cambridge), 66 High Street, Sawston, Cambridge CB2 4BG
Internal R	AM boards RAM option	RAM position(s)	RAM write	Installation	Со	st	Software provided	Available from
SWR 32	32k	15, 14	No	Barec wires	N		5 discs	Solidisk Technology,
SWR 64 SWR 128	64k 128k	15, 14, 13, 12 15, 14, 13, 12, 11, 10, 9, 8	No No	push in (or solder) to legs of chips	£80 £11		5 discs	17 Sweyne Avenue, Southend-on-Sea, Essex SS2 6JQ
HCR 16 HCR 32	16k 32k	15 to 12 15 to 12	Yes Yes	Plug in		5.22	2 utilities	HCR Electronic Services
RAM 16	16k	15 to 12	Optional	Plug in Plug in	£4 £32	2	8 utilities	(as before) Ramamp Computers, 25 Avon Drive, Whetstone, Leicester
UserRAM	16k	12, 13	No	Plug in	Pac	k 1 3.50 k 2 7.95	10 utilities 27 utilities + book	Redwood Publishing, 141-143 Drury Lane, London WC2B 5TF
Watford 16k module	16k	Any	Yes + read	Plug in		3.35	3 utilities	Watford Electronics (as before)

Q Can I run any program in sideways RAM?

A No. Generally speaking only machine code programs written to load at &8000 to &BFFF can run from sideways RAM unless you wish to store programs in ROM filing system format. Looking at your disc contents (using *INFO.*.*), sideways ROM images normally appear as either:

progname 008000 008000 004000 (16k) or progname 008000 008000 002000 (8k)

Q Can I use the ROM Filing System?

A Yes, you can. One of the best packages I know of that enables you to convert your favourite software to run from sideways RAM is Beebugsoft's Romit. This package creates a ROM image of the program from which you can blow an EPROM. It works by downloading the program to its correct execution address in the main RAM and running it. Also, the disc supplied with UserRAM contains a ROM filing system formatter which will take standard Basic program files and format them, enabling them to be loaded into sideways RAM and subsequently loaded as required. A similar program can also be found in Bruce Smith's The BBC Micro ROM Book (published by Collins at £9.95).

Q Please tell me, how do you load software into sideways RAM?

A Most RAM board manufacturers provide information about how to do this. Typically the command: *LOAD ROMimage 8000 <RETURN> followed by either CALL!-4 (or pressing Break), will initialise a ROM image. The B+128 and Master use a unique command: *SRLOAD ROMimage 8000 W Q. Several suppliers such as Solidisk, Ramamp and HCR provide elegant menu programs to do this automatically for you.

Q I am an experienced programmer who wishes to develop my own ROM-based software in sideways RAM.

A The Acorn User UserRAM module has a very substantial range of software to support it and would be an ideal tool for this purpose.

Q I want to utilise 32k of sideways RAM so I can load two ROM images.

A The HCR Electronics 32k board is a reliable and well-designed board. The Solidisk 32k board can also be recommended if you are competent with a soldering iron.

Q I am in charge of a network of BBC micros in an educational institution. Should I purchase RAM expansion boards for each network station?

A Using sideways RAM is a cost-effective means of distributing ROM-based software. UserRAM, Ramamp RA16 and HCR 16/32k units can all be recommended. Most software publishers are now prepared to grant software licences for network users.

Q I have an ATPL Sidewise ROM board and want to add another 16k of sideways RAM to that already present.

A The only system I know that offers such expansion is the RAM module produced by C F Terrell, 7B Essex Gardens, Hornchurch, Essex RM11 3EH. Tel: (04024) 71426. Alternatively, the Aries B32 is now compatible with the Sidewise board.

Q I am a hobbyist who wants to use sideways RAM to the full.

A The Solidisk 64k system is probably the most versatile unit available at present. The new, updated software allows you to configure the RAM in a number of useful ways. You must be prepared for some headaches should you install it yourself, though!

Q I own an Electron. Can I upgrade it with any sideways RAM board?

A The only system available at the moment is the Advanced Computer Products RAM expansion system at £29.90 from 6 Ava House, High Street, Chobham GU24 8LZ. The Solidisk EFS disc interface is also supplied with 16k of sideways RAM. Both systems require a Plus 1 to be fitted to the Electron.

Q I want to upgrade my BBC model B to include shadow RAM, sideways RAM and sideways ROM expansions. Which units should I choose?

A For reasons of compatibility it is best to stick with one manufacturer's product. In this case the best solution would be to install the Aries B32, B12 and two 6264 CMOS RAM chips. Look out for reviews of the new 256k RAM expansion system from Solidisk, which may also provide the answer.

Q I own a Viglen Cartridge ROM system. Is there any value to be gained in installing a sideways RAM board?

A Sideways RAM can be configured into DFS workspace or a printer buffer, both of which are advantageous. The Ramamp RA16 and Solidisk systems offer software to achieve this.

Q I have heard that sideways RAM can be configured into a 'silicon disc'. What is this and how useful is it?

A The Solidisk 64k and 128k boards can be configured into a silicon disc. The computer thinks that another disc drive has been fitted, thus DFS commands will work with the sideways RAM. The RAM-disc is volatile, so if you turn the computer off the RAM-disc is lost. It is useful for spelling checking and database work as the speed of access is about 10 times faster than any conventional disc drive.

I use a Solidisk 32k sideways RAM system but I want to expand my Beeb's ROM capacity. Can I do this without compatibility problems?

A There is only one reliable way that I know, and that is to add a Ramamp ROM6S card. This will give you an extra six ROM slots with the 32k and 64k boards.

Q Is UserRAM compatible with any of the popular sideways ROM expansion boards?

A The only boards I have actually had UserRAM running properly with are the Watford MKII board and the HCR internal board. Maybe readers have found other combinations I have not been able to test yet.

The final answer prompts me to request readers to help us assemble a table of RAM/ROM compatible expansion boards. The only true test of compatibility of specific products is reliability in general – everyday use over a long period of time. If you have used any ROM board/RAM board combinations successfully we would love to hear from you.

Turn to page 96 for details of how you can join our ROM Compatibility Quest

15	Exprom	Aries B12	Ramamp RA32	ATPL Sidewise	Watford SSRB	Micro Pulse Rombox	HCR External	Viglen Cartridge
5	5	4	4	4	2	5	5	5
5	5	5	4	4	4	5	5	5
5	4	4	4	3	3	5	5	5
3	3	4	3	3	3	5	3	5
4	5	4	5	3	4	3	5	3
5	5	5	3	4	3	3	3	3
3	4	4	4	4	3	2	4	4
30	31	30	27	25	22	28	30	30
		3 3 4 5 5 5	3 3 4 4 5 4 5 5 5 3 4 4 30 31 30	3 3 4 3 4 5 4 5 5 5 5 3 3 4 4 4 4 30 31 30 27	3 3 4 3 3 4 5 4 5 3 5 5 5 3 4 3 4 4 4 4 30 31 30 27 25	3 3 4 3 3 3 4 5 4 5 3 4 5 5 5 3 4 3 3 4 4 4 4 3 30 31 30 27 25 22	3 3 4 3 3 5 4 5 4 5 3 4 3 5 5 5 3 4 3 3 3 4 4 4 4 4 3 2 30 31 30 27 25 22 28	3 3 4 3 3 3 5 3 4 5 4 5 3 4 3 5 5 5 5 3 4 3 3 3 3 4 4 4 4 4 3 2 4 30 31 30 27 25 22 28 30

How the internal RAM/ROM boards, external ROM sockets and external RAM/ROM boards score out of 35

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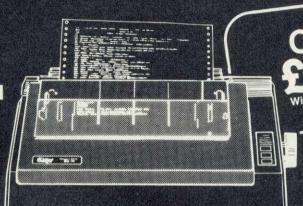




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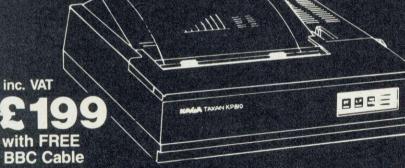
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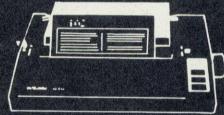
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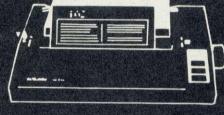


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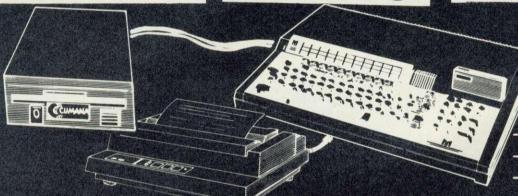
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COMPATIBILITY QUEST

Join Acorn User's quest to find which ROMs work with what, and to persuade software houses to leap into action to solve those incompatibility problems

Simon Williams

ith only 16 slots available for expansion ROMs, and many times that number of products vying for attention, it makes sense to choose wisely, by studying advertisements and reading reviews in magazines such as *Acorn User*. Even then, though, you're guaranteed little, due to an exasperating and increasingly prevalent problem which rarely seems to get a proper airing.

The more sideways ROMs you buy, the more conflicts appear between different products. These 'tiffs' vary from one ROM answering another's command, to two ROMs refusing to live in the same machine together. There are various ways round these little battles, but none of them make life any easier for the average micro user.

Avoiding conflict

You can buy an extension zero insertion force (ZIF) socket and only plug in the ROM you want at any time. This can be awkward, however, if you need to call more than one ROM during a session. An alternative is a couple of sideways RAM units, into which you can load disc images of your own ROMs, but this removes the convenience of having 'instant' ROM software in the first place.

Another possibility is the 'ROM manager' ROM, which will 'knock out' other ROMs on request. Some routines even survive a hard reset and the chips can then only be reawoken with a specific command.

It still doesn't solve the problem of working out which ROM caused the conflict in the first place, however.

So why not find out from the software publisher before buying his product? Mainly because the standard reply is 'It's impossible to test our new product with every piece of software on the market'. Fair enough, but they should at least try some of the more obvious

combinations. I recently had a new ROM which made *Wordwise Plus*, normally a very mild-mannered chip, include random disc catalogues in new text files! How about the disc utility chip which so disliked *Disc Doctor* that it turned it off each time the micro was reset! Or the trio of chips XROM, YROM and ZROM which require an impossible order of precedence, eg:

XROM > YROM AND ZROM

YROM > ZROM

ZROM > XROM

Not only are ROM conflicts annoying, but are often extremely hard to trace. Intermittent 'scuffles' may only break out when using obscure sections of code, and the conditions are then very difficult and time-consuming to reproduce. Gradually removing chips from an expansion board until you hit on the offending component may be some people's idea of fun but I've far better things to do with my computing time.

So what's to be done? Well, for a start, software companies could be encouraged to stick to the rules laid down by Acorn. Many of the conflicts between ROMs are brought about because the code is not written using Acorn's service routines.

For instance, ROMs which access the screen directly are asking for trouble. Then there are ROMs which need workspace (normally 'language' ROMs) and aren't choosy about where they find it. However clever a program is, it will not gain popular acceptance if it sits there in the micro giving no quarter to any other program in the machine.

But it isn't all down to the software companies. There are things users can do to help reduce the problems, and the most obvious of these is to help compile a list of troublesome ROMs. Once the software companies know that a particular ROM isn't happy with others, the onus is on them to sort out the problem.

You can help

What we're proposing is a chart of conflicting ROM software. Write in and report any ROMs you're having trouble with – send your comments to: Simon Williams, ROM Compatibility, *Acorn User*, 141-143 Drury Lane, London WC2B 5TF. This doesn't mean having a dig at a product which doesn't do what you imagined it would, but rather providing details of clashes you've come across in your machine. It takes two to conflict so you should have isolated the offenders before writing to us.

What we'll need to compile a list is:

- Basic specification of your machine: make, type and version of any DFS.
- Make, version and amount of any extra memory (shadow or sideways).
- Make and type of any second processor.
- Make and type of any peripherals attached when the conflict occurs.
- Make and version of any other ROMs in your machine (other than those below).
- Make and version of the two ROMs you think are causing the conflict.
- Nature of the conflict (eg, machine crashes with a row of asterisks in the middle of the screen). Is there an initial letter you can use to avoid conflict?
- Response of the software company, if you've reported the trouble (eg, 'We're working on it' or 'It's fixed in version 7.23').
- Any fix you've discovered to resolve the conflict in question.

The more help you can give us in reporting troubles you've had with conflicting software, the sooner we can help other users and the software companies to reduce the problem.

To kick off our compatibility quest we're presenting a list of ROMs and what Acorn micro's they're compatible with on the yellow pages. You'll also find an embryonic chart of conflicting ROMs – we want you to supply more details – and a table of prefix characters used by ROMs – see yellow pages 119 to 120

COMPETITION

ENTER THE GREAT PI RACE

We challenge you to calculate pi the fastest - and win one of three Kaga Taxan KP810 printers

Tony Quinn

The idea of this month's competition is quite simple (in theory at least!). What we want you to do is to calculate the value of that great constant pi! Of course, its value has yet to be set definitely as it is one of those numbers that goes on and on . . . to as many decimal places as you care to choose. What we want you to do is calculate the value rounded up to 500 decimal places accurately, and print out the value of each place on the screen as it is calculated, in the shortest possible time.

The idea came from Peter Corlett. He and James Tout had written a program in assembler that calculated pi to 500 decimal places in less than a minute. The rules are:

- Your program must use one of the recognised standard series (see box) for calculating the correct value of pi rounded up to 500 decimal places as given in figure 1.
- All calculations must be done within the program. No values can be read in. Entries which simply divide one number by another will not be allowed.
- Each place must be displayed on the screen as it is calculated.
- The time taken must be displayed on the screen when the program has finished.
- All programs must be written in mode 6.
- No DATA statements are allowed.
- The programs must be written legally, so no poking the screen or using routines in the Basic or MOS, other than those documented by Acorn, ie, OS calls.
- Programs cannot use sideways RAM or shadow memory on any machine.
- The program must be your own work and

1 Leibnitz' formula (1674):

$$\pi = 4 \left(1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \dots \right)$$

2 Another yersion of Leibnitz:

$$\pi = 2 + 16 \left(\frac{1}{1*3*5} + \frac{1}{5*7*9} + \frac{1}{9*11*13} + \cdots \right)$$

3 Machin's formula (1706): $\pi = 16* \arctan\left(\frac{1}{2}\right) - 4* \arctan\left(\frac{1}{2}\right)$

where
$$\arctan(x) = x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \frac{x^9}{9} - \dots$$

(Reference: Problems for Computer Solution by Gruenberger and Jaffray, published by John Wiley and Sons, currently out of print but you should find it in your local library)

The three standard ways of calculating pi

3.141592653589793238462643383279502884197169
39937510582097494459230781640628620899862803
48253421170679821480865132823066470938446095
50582231725359408128481117450284102701938521
10555964462294895493038196442881097566593344
61284756482337867831652712019091456485669234
60348610454326648213393607260249141273724587
00660631558817488152092096282925409171536436
78925903600113305305488204665213841469519415
11609433057270365759591953092186117381932611
79310511854807446237996274956735188575272489
122793818301194913

Figure 1. The correct value of pi rounded up to 500 decimal places - calculate this as fast as possible

not have been commercially published. Copyright on all entries is with the author.

There are three groups for entries, and the winner in each group will receive a Kaga Taxan KP810 dot matrix printer with a retail price of £229.

- 1 Programs written in Basic. These can be written on an Electron, BBC B/B+ or Master and will be tested on a standard Master in our offices. The program must be written legally. Timing must be done with Basic's TIME function to one-hundredth of a second.
- 2 Programs written in Basic/assembler on Electron, BBC models B, B+ and B+128. You must use your own timing loop with the system clock using OSWORD calls 1 and 2. Machine code must be assembled in the main user memory, ie, above & E00.
- **3** Programs written in Basic/assembler on a Master 128. Group 2 rules apply.

Entries must be submitted on disc or cas-

sette and will be tested on our standard machines in each case. The programs must be written for standard machines without extra hardware such as second processors. Your entry must include the machine it was written on, whether it is in Basic or assembler, and the time (rounded up to the nearest second) marked on the envelope in the top left hand corner. For example: BBC B/Basic/300sec.

Entries which do not have this information on the envelope will be disqualified.

In the case of a tie, the winning entry will be decided by the best suggestion for a competition in *Acorn User*.

We regret that entries cannot be returned, and no correspondence or phone calls will be answered. Winners will be notified by post and their names printed in the September issue.

Send your entries to: *Acorn User*, Redwood Publishing, 141-143 Drury Lane, London WC2B 5TF. Closing date is May 19 1986.

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ADDRESS	
	A
TELEPHONE	
MY ENTRY IS WRITTEN IN BASIC/ASSEMBLER*	
MY TIME IN SECONDS IS	1000

MY SUGGESTION FOR A FUTURE COMPETITION IS

MY SUGGESTION FOR A FUTURE COMPETITION IS

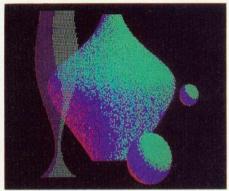


Kaga Taxan KP810 – we've got three to be won

DISC SUBSCRIPTIONS

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Screens from past listings discs - the pencil sharpener appeared in March and 'Scene' in April

Acorn User monthly listings discs have proved to be enormously popular since their introduction in October 1985, so much so that we've decided to offer you the chance to take out a subscription to receive one every month at a really special price.

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Plus there's an added bonus - each month the discs contain screens featured in the magazine which are not included on the monthly listings cassettes, so you get even more for your money!

You can see some of these graphics screens pictured above.

The discs are supplied in 5.25in 40 track format, and conversion instructions are included for 80 track disc users.

Act now! This offer is only valid until May 30 1986. Complete the form below and post it, with your remittance, to the Subscriptions Manager, Acorn User Disc Subscription Offer, Redwood Publishing, 141-143 Drury Lane, London WC2B 5TF.

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So easy to fit

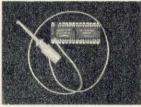
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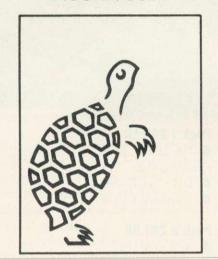
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GRAPHICS



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ACORN USER GRAPHICS CASSETTE



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Four of the most popular and useful graphics programs that we've presented in *Acorn User* – Rob Fenton's *Paintbox*, Peter Sandford's *Colfill* and *Dotfill* and Harry Sinclair's Sprite designer – are now available on one cassette, suitable for use with the BBC micro or Electron, competitively priced at £3.95.

Painthox, (February 1985), offers you a wide palette of facilities – airbrushing, drawing circles and squares, colour filling, colour mixing and textured effects – and it's fast!

Peter Sandford's *Dotfill* and *Colfill* (January and February 1985) allow you to produce bar charts, pie charts, maps, etc, with up to 28 coloured fill patterns and 24 tone patterns, and to mix foreground and background colours.

Harry Sinclair's Sprite designer from the September, October and November 1984 issues of *Acorn User* lets you design full-colour cartoon figures quickly, then edit, clone or mirror them and move them around the screen.

BEST OF ACORN USER CASSETTE



Picture Slide from the Best of Acorn User

The second cassette to be introduced in our developing range of special cassettes, *The Best of Acorn User*, contains a comprehensive selection of 11 program listings from past issues, which you will find entertaining and useful.

It features Malcolm Banthorpe's Turtle Graphics program, an easy introduction to Logo; an all screen mode printer dump for Epson and Epson-compatible printers; a bad program recovery routine for those times when it seems all is lost; a selection of sideways RAM utilities to help you make the most of your discs and ROMs, and two games to keep you amused, *Picture Slide* and *Quadline*.

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The Acorn User User-ROM brings the best of Acorn User permanently into your micro. Put together by our technical editor, Bruce Smith, this 8k ROM chip is packed with your favourite routines that have appeared in the pages of Acorn User over the past two years.

Simply plug the ROM chip into a spare sideways ROM socket and all the routines are instantly accessible via easy to use * commands – what could be simpler!

Routines include the popular colour fill and dot fill routines, bad program recovery, variable lister, function key lister, a graphics compiler, a circle drawing routine, a bulletin board, screen compressor, on screen character fonts, ROM lister, sound compiler, plus lots, lots more!

Quite simply invaluable routines that the serious Acorn user cannot be without!

UserROM gives the following extra commands, either typed from the keyboard, or included as part of a program:

*BORDER – sets up a mode 7 screen with a standard screen border prior to use of *SCROLL; *CHECK – produces a checksum listing of a program in memory; *CIRCLE – will draw a circle in any graphics mode; *COLFILL – a sophisticated, recursive colour



filling routine, provides 27 colourful fills; *COMPRESS – takes a graphics screen and compresses it in size thereby taking less storage space on disc and tape; *DOTFILL – a recursive, dot filling graphics routine, provides 23 new black and white shades;

*EXPAND - returns a previously *COM-PRESSed screen to its original state; *EX-PLODE - explodes the alphanumeric character set into RAM; *FKEYS - lists the definitions in function keys; *GOFF - turns the graphics compile mode off; *GON - turns the graphics compile mode on; *ITALICS selects an italic character font, *MODERN selects a 'modern' character font; *NORMAL - selects the normal character font; *PRO-GRAM - recovers a bad program; *ROMS lists the sideways ROMs present in your machine; *SCREEN - saves the current graphics screen to disc or tape; *SCROLL - moves a scrolling message across the mode 7 screen; and *VARS - lists all names used for noninteger variables.

A 22-page manual is included, which explains in clear simple terms how to get the most from your *UserROM*, and includes many demonstration programs showing how to use the new commands.

LISTINGS

ACORN USER OFFER

May listings on cassette £3.75 or disc £5.75



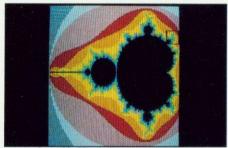
Use Header to customise your own front page



This selection menu offers easy access to programs



There's always a graphics bonus on the disc . . .



. . such as this Mandelbrot set screen

May's monthly program listings cassette features David Johnson-Davies' Mandelbrot set graphics program, a utility to speed up data transfers across the Tube, and a character dump program devised by our printer expert George Hill.

The disc version includes some extra goodies. David Acton's superb *Header* program which you can customise to produce your own 'front end'; a simple-to-use menu selection

providing instant access to all programs with the minimum of fuss; while the detailed catalogue supplies full information on each program. And of course there is the fabulous graphics bonus – this month it includes stunning Mandelbrot graphics screens. At £5.75 it's an absolute steal!

Both tape and disc are available and can be ordered using the form below. Back issues of discs and cassettes are also available.

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TELLUMPAGES

N D E X / C O M P A T I B I L I T Y

Program		Page	ввс в	BBC B+/ 128k	BBC ADFS	Shadow RAM	Electron	Electron with Plus 1	Electron with Plus 3 and Plus 1	Master 128	Master 128 with ADFS	6502SP	Econet	Monthly disc/ tape
First Byte	Listing 1(a)	105	•						•					
Tube Extension												-	•	•
	Listing 1	106												
	Listing 2	108												
	Listing 3	109												
DIY Dumping								THE PARK		- The same				
	Listing 1(b)	110		•										
	Listing 2(b)	111		•			•							
	Listing 3(b)	111					•				•	0		
	Listing 4(b)	112						•		•	•	•		
	Listing 5(b)	113	•	•		•			•				•	
Mandelbrot Set			The Part	AND DESCRIPTION OF THE PARTY OF								THE RESERVE	OF STREET	
	Listing 1	114 114			0	0	•	•	•	•	•	•		
	Listing 2	114					•		:					
	Listing 3	115	•		•				•					
Crabb														
	Listing 1													

Entering listings

Where possible, programs are listed with line numbers in increments of 10 so type AUTO < RETURN> for automatic line numbering before you start. Don't type a space after the line number. To list your program so it appears identical to the printed version in the magazine, type:

LISTO 1 < RETURN > WIDTH 40 < RETURN > LIST < RETURN >

With screen modes 1,4,6 or 7, WIDTH 40 is not needed. Occasionally, for clarity, programs are listed with a text width different to 40 characters.

First Byte, see page 54

Listing 1. A tape-to-disc transfer program. NB: this listing is dumped with WIDTH = 41

10 REM Tape-to-disc transfer program 20 REM by Tessie Revivis 30 REM for B/B+/M/E

40 REM (c) Acorn User May 1986

50 : 60 MDDE 7

70 space%=(HIMEM-TOP-512) AND &FF00

80 DIM oscli% 40, mem% space% 90 PROCcentre(2, "Tape-to-disc transfer

100 PROCcentre (5, "Rewind your tape to t

he start.")

110 PROCcentre (7, "press PLAY on your ta pe machine")

120 PROCcentre (9, "then press any key.")

130 *FX 15 140 *MOTOR 1

150 any=GET 160 CLS

170 PROCcentre (2, "Transferring programs

180 VDU 28,0,8,39,6

190 DN ERROR PROCEFFOR: END

200 REPEAT

210 CLS

220 *TAPE

230 *OPT 1,2

240 PROCoscli("LOAD """" "+STR\$~mem%)

250 is=""

Continued ▶

Typing errors in Basic will usually cause error messages when the program is run. Finding errors in assembly language listings can be harder so we provide small, checking routines (called 'checksums') where possible.

All the Yellow Pages listings will work with Basic 1, 2 and 4 (unless stated otherwise) and with operating system OS1.2 or later operating systems.

Great care is taken to ensure the listings printed are correct but turn to Blunder box (page 17) to check if any errors were made in the previous issue.

⋖ Continued

260 PRINTTAB(0,1); 270 FOR char=0 TO 39

280 is=is+CHRs(FNreadchar)

290 VDU 32

300 NEXT Char

310 *DISC

320 PROCoscli("SAVE "+LEFT\$(i\$,7)+" "+8 TR\$~mem%+" +"+MID\$(i\$,15,4))

330 UNTIL FALSE

340 :

350 DEF FNreadchar

360 A%=135: X%=0: Y%=0 370 =(USR(&FFF4) AND &FF00)/256

380 :

390 DEF PROCoscli(\$oscli%)

400 X%=oscli%:Y%=oscli% DIV 256 410 CALL &FFF7

420 ENDPROC

430 1

440 DEF PROCcentre (y,t\$)

450 PRINTTAB (20-LENt\$/2, y) t\$

460 ENDPROC

470

470 | 480 DEF PROCerror 490 *DISC 500 *OPT 510 VDU 26,12

520 PROCCentre(2, "Transfer aborted")
530 IF ERR<>17 PRINTTAB(10,10);:REPORT:
PRINT" at line ";ERL

540 ENDPROC

YELLOW PAGES

How to enter It's Quicker by Tube

Martin Chaplin presents three listings in this month's yellow pages. Listings 1 and 2 assemble two machine code routines; one to sit in the second processor and the other to live in the input output processor on the main board. Listing 3 tests the extended facilities provided by listings 1 and 2.

Listing 1 assembles the code intended for the second processor. Make sure that you are using HiBasic when running this listing. Because listing 1 contains a lot of assembly language a checksum routine has been included (lines 2330 to 2370). Any errors found will be reported with a message prompting you to check your listing. The assembled code is saved at line 2380 with the filename M.X_HIBAS.

If you have made a typing error while entering listing 1 then ensure that after you have corrected your mistakes you save the new version. Before running listing 1 again you should press the Break key and either type OLD < Return > or load the corrected version back in.

Listing 2 assembles the machine code routine which lives in the main BBC micro. It can be run using Basic 2 or HiBasic. Again, a checksum routine has been included (lines 1460 to 1500) to detect any typing errors made. The finished code is saved with the filename M.IOTUBE at line 1510.

To implement the enhanced version of HiBasic, the following steps should be taken:

- 1. Reset machine by pressing CTRL-Break.
- 2. Load HiBasic if it is not resident in the machine.
- 3. Check that HiBasic is operating correctly by typing: PRINT ~ HIMEM

The value printed should be & B800.

- 4. Set up the BBC micro end by typing:
 - *RUN M.IOTUBE
- 5. Set up the second processor end by typing:
 - *RUN M.X_HIBAS

The extended facilities are now available for use. You can now enter listing 3 to test the extended HiBasic. Note, though, that listing 3 makes use of the new keyword 'TUBE' and so must only be entered once extended HiBasic has been installed. Running listing 3 will take you through a demonstration of the new commands.

Points to watch

Net or ADFS users should note that directories 'A' and 'M' are used and these should be created using *CDIR beforehand to avoid a 'not found' error.

The code M.IOTUBE should not be *RUN more than once without pressing the Break key, since it intercepts the OSBYTE vector.

Listing 1. A program to set up the second processor at both ends of the Tube

10 REM Tube Extensions - 6502SP end

```
20 REM by Martin Chaplin
30 REM for BBC B/B+ with 6502SP
40 REM (c) Acorn User May 1986
50 :
60 REM Run in 2nd processor using
70 REM HIBASIC
80 :
90 HIMEM-HIMEM-&10F
100 PROCconstants
110 PROCassemble
120 PROCsave
130 END
140
150 DEF PROCconstants
160 tubestatus=&FEFA
170 tubedata=&FEFB
180 buffer=&50
190 direction=buffer
200 motherboard=buffer+1
210 osbytecode=buffer+3
220 transferbytes=buffer+4
230 reason=buffer+6
240 satellite=buffer+7
250 offset=&A
260 pointer=&B
270 lowbyte=&2A
280 highbyte=&2B
290 thirdbyte=&20
300 evaluate=&CO43
310 coldstart=&C2F8
320 nextbyte=&C2B6
330 hibasic=&C3B3
340 ENDPROC
350
360 DEF PROCassemble
370 FOR pass=0 TO 3 STEP 3
380 P%=HIMEM
390 COPT pass
400 .tokenspace
410 LDA #&EC
420 STA &203
430 CLI
440 JMP coldstart
    .action
450
460 INY
470 LDA
        (pointer), Y
480 CMP #&A5
490 BEQ tubeget
        #ASC ("G")
500 CMP
510 BEQ tubeget
        #ASC ("P")
520 CMP
530 BNE tuberror
540 LDA #&FF
550 BNE always
560 .tubeget
570 LDA #0
580 .always
590 STA direction
600
    .discard
610 INY
        (pointer), Y
620 LDA
630 CMP #ASC ("A")
640 BCS discard
650 .next
660 STY offset
670 JSR evaluate
680 LDA lowbyte
690 STA motherboard
```

Continued ▶

ACC

VELLOW PAGES UTILITIES

```
■ Chaplin's listing 1 continued

  700 LDA highbyte
  710 STA motherboard+1
  720 JSR nextbyte
730 CMP #ASC(",")
  740 BEQ comma
  750 .tuberror
  760 BRK
  770 EQUB &60
  780 EQUB &CE
  790 EQUB &20
  800 EQUB &85
  810 BRK
  820 .comma
  830 JSR evaluate
  840 LDA lowbyte
  850 STA satellite
  860 LDA highbyte
  870 STA satellite+1
  880 JSR nextbyte
  890 CMP #ASC(",")
  900 BNE tuberror
  910 JSR evaluate
  920 LDA lowbyte
  930 STA transferbytes
 940 LDA highbyte
  950 STA transferbytes+1
 960 .standalone
 970 LDA #&A4
 980 STA osbytecode
 990 LDY #6
1000 STY reason
1010 .sendparams
1020 LDA buffer, Y
1030 .wait
1040 BIT tubestatus
1050 BVC wait
1060 STA tubedata
1070 DEY
1080 BPL sendparams
1090 LDA direction
1100 BPL get
1110 .put
1120 LDY #0
1130 LDX transferbytes+1
1140 BEQ 1p
1150 .hiloop
1160 LDA (satellite), Y
1170 .waitagain
1180 BIT tubestatus
1190 BVC waitagain
1200 STA tubedata
1210 INY
1220 BNE hiloop
1230 INC satellite+1
1240 DEX
1250 BNE hiloop
1260 .1p
1270 LDX transferbytes
1280 BEQ out
1290 .loop
1300 LDA (satellite), Y
1310 .waitrep
1320 BIT tubestatus
1330 BVC waitrep
1340 STA tubedata
1350 INY
1360 CPY transferbytes
1370 BNE 100p
1380 .out
1390 JMP hibasic
1400 .get
```

```
◄ Continued
 1410 LDY #0
 1420 LDX transferbytes+1
 1430 BEQ 1op
 1440 .hilooprep
 1450 BIT tubestatus
 1460 BPL hilooprep
 1470 LDA tubedata
 1480 STA (satellite), Y
 1490 INY
 1500 BNE hilooprep
 1510 INC satellite+1
 1520 DEX
 1530 BNE hilooprep
 1540 .lop
 1550 LDX transferbytes
 1560 BEQ out
 1570 .lopp
 1580 BIT tubestatus
 1590 BPL 10pp
 1600 LDA tubedata
 1610 STA (satellite), Y
 1620 INY
 1630 CPY transferbytes
 1640 BNE 10pp
 1650 BEQ out
 1660 .call
 1670 PHA
 1680 PHP
 1690 LDA thirdbyte
 1700 CMP #&FF
 1710 BEQ newcall
 1720 PLP
 1730 PLA
 1740 JMP (lowbyte)
 1750
      .newcall
 1760 LDA #6
 1770 JSR send
 1780 TYA
 1790 JSR send
 1800 TXA
 1810 JSR send
 1820 LDA #&A4
 1830 JSR send
 1840 LDA highbyte
 1850 JSR send
 1860 LDA lowbyte
 1870 JSR send
 1880 LDA #1
 1890 JSR send
 1900 PLA
 1910 JSR send
 1920 PLA
 1930
     . send
 1940 BIT tubestatus
 1950 BVC send
 1960 STA tubedata
 1970 RTS
 1980 ]
 1990 NEXT pass
 2000 FOR X%=&B871 TO &BB31
2010 X%?-6=?X%
2020 NEXT X%
2030 ?&C210=&6B
2040 ?&ED19=&6B
2050 ?&BBB4=action MOD 256
2060 ?&BC26=action DIV 256
2070 ?&C3C9=&CE
2080 FDR pass=0 TD 3 STEP 3
2090 P%=&BB2C
2100 COPT pass
2110 EQUS"TUBE"
```

Continued ▶

YELLOW PAGES

Chaplin's listing 1 continued 2120 EQUB &CE 2130 EQUB &2 2140] 2150 P%=&B868 2160 COPT pass 2170 JMP tokenspace 2180] 2190 P%=&C746 2200 COPT pass 2210 JMP call 2220] 2230 P%=&BB23 2240 COPT pass 2250 NOP 2260 LDX #HIMEM MOD 256 2270 LDY #HIMEM DIV 256 2280] 2290 NEXT pass 2300 ENDPROC 2310 : 2320 DEF PROCsave 2330 LOCAL sum% 2340 FOR X%=HIMEM TO &F7FF STEP4 2350 sum%=sum%+!X% 2360 NEXT X% 2370 IF sum%<>&A5B5F2CD PRINT"Check for

2380 OSCLI"SAVE M. X_HIBAS "+STR\$~HIMEM+

Listing 2. A program to set up the BBC at both ends of the Tube

possible assembly error"

" F800 B800"

2390 ENDPROC

```
10 REM Tube Extensions - BBC end
20 REM by Martin Chaplin
30 REM for BBC B/B+ with 6502SP
40 REM (c) Acorn User May 1986
50 :
60 REM Run in 6502 2nd processor
70 REM using BASIC2 or HIBASIC
90 PROCconstants
100 PROCassemble
110 PROCsave
120 END
130 :
140 DEF PROCconstants
150 start%=&1F00
160 tubestatus=&FEE2
170 tubedata=&FEE3
180 romid=&F4
190 latch=&FE30
200 buffer=&60
210 direction=buffer
220 motherboard=buffer+1
230 bytestransfer=buffer+3
240 bytev=&20A
250 ENDPROC
260 :
270 DEF PROCassemble
280 FOR pass=0 TO 3 STEP 3
290 P%=start%
300 COPT pass
```

Continued ▶

310 LDA bytev

320 STA oldbytev+1 330 LDA bytev+1

```
⋖ Continued
  340 STA oldbytev+2
 350 LDA #tube MOD 256
  360 STA bytev
  370 LDA #tube DIV 256
  380 STA bytev+1
 390 RTS
  400 .fxout
  410 CPX #1
  420 BNE outfx
  430 STY romid
  440 STY latch
  450 .outfx
  460 LDA #130
  470 .oldbytev
  480 JMP &0000
 490 .tube
500 CMP #&A4
  510 BNE oldbytev
  520 STY bytestransfer
  530 STX bytestransfer+1
  540 BIT tubestatus
  550 BPL fxout
  560 PLA
  570 PLA
  580 LDA #0
  590 PHA
  600 LDA #&36
  610 PHA
  620 LDX #2
  630 .receive
  640 BIT tubestatus
  650 BPL receive
  660 LDA tubedata
  670 STA buffer, X
  680 DEX
  690 BPL receive
  700 LDA direction
  710 BEQ get
  720 BPL call
  730 .put
  740 LDY #0
  750 LDX bytestransfer+1
  760 BEQ loloop
  770 .hiloop
  780 BIT tubestatus
  790 BPL hiloop
  800 LDA tubedata
  810 STA (motherboard), Y
  820 INY
  830 BNE hilbop
  840 INC motherboard+1
  850 DEX
  860 BNE hiloop
  870 .loloop
  880 LDX bytestransfer
  890 BEQ out
  900 .loop
  910 BIT tubestatus
  920 BPL 100p
  930 LDA tubedata
  940 STA (motherboard), Y
  950 INY
  960 CPY bytestransfer
  970 BNE 100p
  980 .out
  990 RTS
 1000 .get LDY#0
1010 LDX bytestransfer+1
 1020 BEQ 101p
```

YELLOW PAGES

■ Chaplin's listing 2 continued 1030 .hilp 1040 LDA (motherboard), Y 1050 .send 1060 BIT tubestatus 1070 BVC send 1080 STA tubedata 1090 INY 1100 BNE hilp 1110 INC motherboard+1 1120 DEX 1130 BNE hilp 1140 .lolp 1150 LDX bytestransfer 1160 BEQ out 1170 .lolop 1180 LDA (motherboard), Y 1190 .sending 1200 BIT tubestatus 1210 BVC sending 1220 STA tubedata 1230 INY 1240 CPY bytestransfer 1250 BNE lolop 1260 RTS 1270 .call 1280 LDX buffer+3 1290 LDY buffer+4 1300 .rec 1310 BIT tubestatus 1320 BPL rec 1330 LDA tubedata 1340 PHA 1350 PLP 1360 .gather 1370 BIT tubestatus 1380 BPL gather 1390 LDA tubedata 1400 JMP (motherboard) 1410] 1420 NEXT pass 1430 ENDPROC 1440 : 1450 DEF PROCsave 1460 LOCAL sum% 1470 FOR X%=start% TO P%-1 1480 sum%=sum%+?X% 1490 NEXT X% 1500 IF sum%<>&6BA6 PRINT"Check for pos ible assembly error" 1510 OSCLI"SAVE M. IOTUBE "+STR\$~start%+ " "+STR\$~P%+" FFFF"+STR\$~start%+" FFFF"+

Listing 3. A test for both listings 1 and 2

STR\$~start%

1520 ENDPROC

```
10 REM Tube Extensions Test
20 REM by Martin Chaplin
30 REM for BBC B/B+ with 6502SP
40 REM (c) Acorn User May 1986
50:
60 REM Runs in 6502 2nd processeor
70:
80 ON ERROR GOTO 1180
90 MODE 1
100 COLOUR 2
110 PRINT"Please wait"
```

Continued ▶

⋖ Continued 120 FOR X%=&6200 TO &B1FF STEP 4 130 !X%=&A5A5A5A5 140 NEXT X% 150 PRINT"Test new FX call, *FX164,"; 160 PRINT" which checks" 170 PRINT"that the TUBE software is"; 180 PRINT" at the other 190 PRINT"end of the TUBE" 200 GCOL 0,129 210 VDU 24,150;200;1130;750; 220 CLG 230 *FX 164 240 PRINT"*FX164 DK" 250 PROCpause 260 TUBEGET &3000, &1200, &5000 270 TUBEPUT &3000,&6200,&5000 280 PRINT'"TUBEGET &3000,&1200,&5000" 290 PRINT"Gets &5000 bytes from"; 300 PRINT" Input/Output" 310 PRINT"motherboard and puts"; 320 PRINT" them from &1200 to" 330 PRINT"&6200 in the 2nd processor" 340 PRINT'"TUBEPUT &3000,&6200,&5000" 350 PRINT"Puts &5000 bytes from"; 360 PRINT" 2nd processor at" 370 PRINT"&6200-&B200 into screen"; 380 PRINT" memory (&3000-" 390 PRINT"&8000) in motherboard" 400 PROCpause 410 CIS 420 PRINT"More code" 430 FOR X%=0 TO 3 STEP 3 440 P%=&2800 450 COPT X% 460 LDA #0 470 STA &2870 480 LDA #&29 490 STA &2871 500 JMP (&2870) 510] 520 P%=&2900 530 COPT X% 540 STA &1900 550 STX &1901 560 STY &1902 570 PHP 580 PLA 590 STA &1903 600 RTS 610] 620 NEXT 630 PROCpause 640 CLS 650 PRINT"CALL&2800" 660 PRINT"Checks out code" 670 PRINT" If OK it is followed by :" 480 PRINT"TUBEPUT &2800, &2800, &5800" 690 CALL &2800 700 PROCpause 710 TUBEPUT &2800, &2800, &5800 720 REM Ensure no program at &2900 730 ?&2900=0 740 PROCpause 750 CLS 760 PRINT" "Check CALL extension" 770 PRINT"AX=1:XX=2:YX=3:CX=0:"; 780 PRINT"CALL &FF2900" 790 A%=1 800 X%=2

```
    Chaplin's listing 3 continued

    810 Y%=3
820 C%=0
    830 CALL &FF2900
    840 PROCpause
    850 PRINTTAB(0,5) "&1900 holds";
    860 PRINT" the A register"
870 PRINT"&1902 holds the Y register"
     880 PRINT"&1903 holds the P register"
    890 PRINT""!&1900 in 2nd Proc";
     900 PRINT" = &";~!&1900
    910 TUBEGET&1900,&1900,&4
     920 PRINT"~!&1900 in IO Proc";
     930 PRINT" = &";~!&1900
     940 A%=2
     950 X%=3
     960 Y%=1
     970 C%=&FF
     980 CALL &FF2900
    990 PRINT"A%=2: X%=3: Y%=1: C%=&FF: ":
    1000 PRINT"CALL &FF2900 AGAIN"
    1010 TUBEGET &1900,&1900,&4
    1020 PRINT"New ~! &1900 in ID Proc";
    1030 PRINT" = &";~!&1900
    1040 PROCpause
1050 TUBE
    1060 PRINTTAB(3,20) "Test completed";
    1070 PRINT" successfully"
    1080 END
    1090 :
    1100 DEF PROCpause
    1110 PRINTTAB(0,31) "Press a key";
    1120 PRINT" to continue";
    1130 REPEAT UNTIL GET
    1140 PRINTTAB(0,31)STRING$(23," ");
    1150 ENDPROC
    1160 :
    1170 REM Check error in Line 1050
    1180 IF (ERR=&60) AND (ERL=1050) PRINTT
   AB(0,16);:REPORT:PRINT":-Error message t
   ested DK":GOTO 1060
    1190 CLS
    1200 PRINTTAB(5,5) "Test error"''
    1210 REPORT
    1220 PRINT" @ Line No. "; ERL
    1230 END
```

How to enter DIY Dumping

All five programs are straightforward. As the assembler in each is short a checksum has not been included. With the exception of the 'HtoV' listing all programs require an Epson or Epson compatible dot-matrix printer to work. Electron owners will obviously need to have the Plus 1 attached to be able to use a printer.

The CDUMP program is numbered from line 10000 onwards. This is deliberate as it is not a stand alone program but instead a procedure that can be spooled onto the end of a main program. After entering CDUMP save it as an ASCII spool file thus:

```
*SPOOL CDUMP
TILI
```

*SPOOL

The program will list to tape or disc.

The program 'SPLSCRN' tests CDUMP. Enter and save SPLSCRN. CDUMP can be appended to the end of SPLSCRN by performing,

*EXEC CDUMP.

To use CDUMP you will need to insert an extra line at the point where you wish the character dump to take place. In the case of SPLSCRN place it as follows:

```
75 PROCedump
```

```
Listing 1. Single characters are prompted from the screen and are printed
out using their definitions
      10 REM CHARPRT
      20 REM by George Hill
      30 REM B/B+/M/E with Plus 1
      40 REM (C) Acorn User May 1986
      50 :
      60 MODE 6
      70 ON ERROR PROCerror: END
      80 :
      90 PROCinitialise
     100 REPEAT
     110 PROCeetchar
     120 CALL code
     130 PROCprintit
     140 UNTIL FALSE
     150 END
     160 :
     170 DEF PROCinitialise
     180 DIM code 47
     190 osword=&FFF1
     200 VDU 23,240,1,3,7,15,31,63,127,255
210 VDU 23,241,1,3,5,9,31,33,65,129
     220 PROCassemble
     230 VDU 2
     240 ENDPROC
     250 :
     260 DEF PROCassemble
     270 FOR pass=0 TO 2 STEP 2
     280 P%=code
     290 COPT pass
     300 .code
     310 LDA #&OA
     320 LDX #char MOD 256
     330 LDY #char DIV 256
     340 JSR osword
     350 :
     360 .htpv
     370 LDY #7
     380 .10op1
     390 LDX #7
     400 .10op2
     410 LDA cchar, Y
     420 LSR A
     430 STA cchar, Y
     440 ROR pchar, X
     450 DEX
     460 BPL 100p2
     470 DEY
     480 BPL 100p1
     490 RTS
     500 1
     510 char=P%
     520 cchar=P%+1
     530 pchar=P%+9
     540 NEXT
     550 ENDPROC
     560 :
     570 DEF PROCgetchar
     580 INPUT"Type a character, or an ASCI
   I code: "char$
     590 ch=ASC(LEFT$(char$,1))
     600 IF LEN(char$)>1 AND ch>47 AND ch<5
   9 THEN ch=VAL (char$)
     610 ?char=ch
     620 ENDPROC
     630 :
     640 DEF PROCprintit
     650 VDU 1,27,1,75,1,8,1,0
     660 FOR index=0 TO 7
```

■ Hill's listing 1 continued 670 VDU 1,pchar?index 680 NEXT 690 VDU 1,10 700 ENDPROC 710: 720 DEF PROCerror 730 FOR NX=0 TO 40 740 VDU 1,127 750 NEXT 760 VDU 1,27,1,64,3,10,13 770 IF ERR<>17 THEN REPORT:PRINT" at 1 ine ";ERL

780 ENDPROC

```
Listing 2. It reads a character and reproduces it exactly
     10 REM TYPWRTR
     20 REM by George Hill
     30 REM B/B+/M/E with Plus 1
     40 REM (C) Acorn User May 1986
     50 REM PAGE=PAGE+&600
     60 :
     70 MODE 3
     80 PROCinitialise
     90 PRINT SPC(20); CHR$(240); " George's
   Typewriter Program "; CHR$(241)'
    100 REPEAT
    110 ?char=GET
    120 IF ?char=13 THEN VDU 13:PROCprint1
  ine ELSE VDU?char
    130 IF POS=79 THEN VDU 7,8
    140 UNTIL FALSE
    150 END
    160 :
    170 DEF PROCinitialise
    180 P$="The value of PAGE is too low t
  o permit you to redefine the normal char
  acters."+CHR$(10)+CHR$(13)+"Reset PAGE,
  then reload program."
    190 DIM code 107
    200 oswrch=&FFEE
    210 osbyte=&FFF4
    220 osword=&FFF1
    230 REM Check filing system
    240 osarqs=&FFDA
    250 A%=0: X%=&70: Y%=0
    260 F%=USRosargs MOD 256
    270 IF (F%=1 OR F%=2 OR F%=3) AND PAGE
  <(&E00+&600) THEN PRINT P$:STOP
    280 IF F%=4 AND PAGE< (&1900+&600) THEN
   PRINT P$: STOP
  290 IF (F%=5 DR F%=6) AND PAGE<(&1200+
&600) THEN PRINT P$:STOP
    300 *FX20,6
    310 PROCdefinechars
    320 REM Initialise printer
    330 VDU 2,1,27,1,64,3
    340 PROCassemble
    350 ENDPROC
    360 :
    370 DEF PROCprintline
    380 VDU 2,1,27,1,76,1,128,1,2
    390 FOR N%=1 TO BO
    400 CALL code
    410 VDU 3,9,2
    420 NEXT
    430 VDU 1,10,3
Continued ▶
```

```
◄ Continued
    440 ENDPROC
    450 :
    460 DEF PROCassemble
    470 FOR pass=0 TO 2 STEP 2
    480 P%=code
    490 COPT pass
    500 .code
    510 \read character
    520 LDA #135
    530 JSR osbyte
    540 STX char
    550 LDA #&OA
    560 LDX #char MOD 256
    570 LDY #char DIV 256
    580 JSR osword
    590 .htov
    600 LDY #7
    610 .loop1
    620 LDX #7
    630 .10op2
    640 LDA cchar, Y
    650 LSR A
    660 STA cchar, Y
    670 ROR pchar, X
    680 DEX
    690 BPL 100p2
    700 DEY
    710 BPL 100p1
    720 \print character
    730 LDX #0
    740 .10op3
    750 LDA #1
    760 JSR oswrch
    770 LDA pchar, X
    780 JSR oswrch
    790 INX
    800 CPX #8
    810 BNE 100p3
    820 RTS
    830 ]
    840 char=P%
    850 cchar=P%+1
    860 pchar=P%+9
    870 NEXT
    880 ENDPROC
    890 :
    900 DEF PROCdefinechars
   910 REM Redefine what you like here.
920 VDU 23,240,1,3,7,15,31,63,127,255
930 VDU 23,241,&80,&CO,&EO,&FO,&FB,&FC
 , &FE, &FF
    940 VDU 23,45,1,5,9,17,63,65,129,0
950 ENDPROC
```

```
Listing 3. Dumping procedure to let you print user-defined characters when dumping a screen one character at a time

10000 REM CDUMP
10010 REM by George Hill
10020 REM B/B+/M/E with Plus 1
10030 REM (C) Acorn User May 1986
10040 REM Must be merged with a
10050 REM dumping program — see notes
10060:
10070 DEF PROCCdump
```

Continued ▶

10080 DIM code 48

◀ Hill's listing 3 continued

```
10090 osword=&FFF1
10100 osbyte=&FFF4
10110 PROCassemble
10120 PROCreadparameters
10130 PROCdump
 10140 ENDPROC
10150 :
10160 DEF PROCassemble
10170 FOR pass=0 TO 2 STEP 2
10180 P%=code
10190 COPT pass
10200 .code
10210 LDA #&OA
10220 LDX #char MOD 256
10230 LDY #char DIV 256
10240 JSR osword
10250 :
10260 .htov
10270 LDY #7
10280 .loop1
10290 LDX #7
10300 .10op2
10310 LDA cchar, Y
10320 LSR A
10330 STA cchar, Y
10340 RDR pchar, X
10350 DEX
10360 BPL 100p2
10370 DEY
10380 BPL 100p1
10390 RTS
10400 ]
10410 user=P%
10420 char=P%+1
10430 cchar=P%+2
10440 pchar=P%+10
10450 NEXT
10460 ENDPROC
10470 :
10480 DEF PROCdump
10490 VDU 26,2
10500 VDU 1,27,1,65,1,linefeed
10510 FOR YX=1 TO linesperpage
10520 VDU 1,27,1,density,1,n1,1,n2
10530 FOR XX=1 TO charsperline
10540 !user=USR osbyte
10550 CALL code
10560 FDR N%=0 TD 7
10570 VDU 1,N%?pchar
10580 IF twofive THEN VDU 1,N%?pchar
10590 NEXT
10600 VDU 3,9,2
10610 NEXT
10620 VDU 1,10
10630 NEXT
10640 VDU 1,12,1,27,1,64,3
10650 ENDPROC
10660 :
10670 DEF PROCreadparameters
10680 A%=135
10690 !user=USR osbyte
10700 mode=user?2
10710 RESTORE 10800
10720 FOR N%=0 TO mode
10730 READ linefeed, linesperpage, charspe
rline, density, n1, n2, twofive
10740 NEXT
10750 ENDPROC
```

Continued >

10760 :

⋖ Continued

```
10770 REM DATA contains 7 parameters, 10780 REM one line per Mode. 10790: 10800 DATA 8,32,80,76,128,2,0 10810 DATA 8,32,40,75,64,1,0 10820 DATA 8,32,20,75,64,1,-1 10830 DATA 10,25,80,76,128,2,0 10840 DATA 8,32,40,75,64,1,0 10850 DATA 8,32,20,75,64,1,-1 10860 DATA 10,25,40,75,64,1,0 10870 DATA 10,25,40,75,64,1,0
```

```
Listing 4. Sample-screen for dumping with CDUMP
```

```
10 REM SPLSCRN - to test CDUMP
   20 REM by George Hill
   30 REM B/B+/M/E with Plus 1
   40 REM (C) Acorn User May 1986
   50 :
   60 PROCinitialise
   70 PROCsample
   80 END
   90 :
  100 DEF PROCinitialise
  110 DIM scruser 3
  120 osbyte=&FFF4
  130 PROCread
  140 VDU 26,12
  150 ENDPROC
  160 :
  170 DEF PROCsample
  180 VDU 23,240,1,3,7,15,31,63,127,255
190 VDU 23,241,&80,&CO,&EO,&FO,&FB,&FC,
&FE,&FF
  200 VDU 23,242,255,129,129,129,129,129,
129,255
 210 VDU 23,243,1,3,5,9,17,33,65,129,255
220 VDU 23,244,1,1,1,1,1,1,1
230 VDU 23,245,128,128,128,128,128,128,
128,128
  240 VDU 23,246,8,28,28,107,127,107,8,28
  250 VDU 23,247,8,28,62,127,62,28,8,0
260 VDU 23,248,54,127,127,127,62,28,8,0
  270 VDU 23,249,8,28,62,127,127,127,28,6
  280 PRINTTAB(charsperline/2-8,0); CHR$(2
40); "SAMPLE SCREEN"; CHR$(241)
  290 FOR N%=1 TO linesperpage-2
  300 PRINT CHR$(244); CHR$(32);
  310 FOR J%=0 TO charsperline DIV 2-4
  320 PRINT CHR$(32); CHR$(246+J% MOD 4);
  330 NEXT
  340 PRINT CHR$(32); CHR$(32); CHR$(245)
  350 NEXT
  360 PRINTTAB (charsperline/2-8, linesperp
age-1); "BOTTOM LINE"; CHR$(242); CHR$(243);
  370 ENDPROC
  380 :
  390 DEF PROCread
  400 A%=135
  410 !scruser=USR osbyte
  420 mode=scruser?2
  430 RESTORE 490
  440 FOR N%=0 TO mode
  450 READ linefeed, linesperpage, charsper
      line, density, n1, n2, two five
```

⋖ Continued

◀ Hill's listing 4 continued

```
440 NEXT

470 ENDPROC

480:

490 DATA 8,32,80,76,128,2,0

500 DATA 8,32,40,75,64,1,0

510 DATA 8,32,20,75,64,1,-1

520 DATA 10,25,80,76,128,2,0

530 DATA 8,32,40,75,64,1,0

540 DATA 8,32,20,75,64,1,-1

550 DATA 10,25,40,75,64,1,0

560 DATA 10,25,40,75,64,1,0
```

Listing 5. Illustrates how the bit-by-bit conversion is carried out

```
10 REM HtoV
 20 REM by George Hill
 30 REM B/B+/M/E
 40 REM (C) Acorn User May 1986
 50 :
 60 MODE 1
 70 VDU 23,1,0;0;0;0;
 80 PROCconstants
 90 PROCheadings
100 PROCgrids
110 PROCdisplays
120 PROCspin
130 VDU 17,3,31,0,31,23,1,1;0;0;0;
140 END
150 :
160 DEF PROCconstants
170 delay%=1000
180 null$="Z"
190 A1X=3:A1Y=2
200 A2X=23: A2Y=13
210 ACX=23: ACY=2
220 G1X=32*A1X-16
230 G1Y=32*(32-A1Y)-496
240 G2X=32*A2X-16
250 G2Y=32*(32-A2Y)-496
260 GCX=32*ACX-16
270 GCY=32*(32-ACY)-48
280 DIM bit1$(7,7),bit2$(7,7)
290 DIM hpos(7,7), vpos(7,7)
300 FDR N%=0 TD 7
310 FOR J%=0 TO 7
320 bit1$(N%,J%)=STR$(RND(2)-1)
330 bit2*(N%,J%)=null$
340 hpos(N%,J%)=2*J%
350 vpos(N%,J%)=2*N%
360 NEXT
370 NEXT
380 carry$=null$
390 ENDPROC
400 :
410 DEF PROCgrids
420 PROCgrid (G1X,G1Y,FALSE)
430 PRDCgrid (G2X,G2Y,TRUE)
440 ENDPROC
450
460 DEF PROCdisplays
470 COLOUR 2
480 PROCdisplayarray(A1X,A1Y,FALSE)
490 PROCdisplayarray(A2X,A2Y,TRUE)
500 PROCcarry (GCX,GCY)
```

510 ENDPROC Continued ▶

```
520 :
     530 DEF PROCgrid (XL, YL, two)
     540 LOCAL m,n
     550 IF two THEN m=21:n=5 ELSE m=5:n=21
     560 XH=XL+32*16
     570 YH=YL+32*16
     580 FOR X=XL TO XH STEP 64
     590 MOVE X,YL
     600 PLOT n, X, YH
     610 NEXT
     620 FOR Y=YL TO YH STEP 64
630 MOVE XL,Y
     640 PLOT m, XH, Y
     450 NEXT
     660 ENDPROC
     670 :
     680 DEF PROCdisplayarray(XL,YL,array)
     690 FOR N%=0 TO 7
     710 PRINTTAB(hpos(N%,J%)+XL,vpos(N%,J%
  )+YL);
     720 IF array THEN PRINTbit2$(N%,J%); E
  LSE PRINTbit1$(N%,J%);
     730 NEXT
     740 NEXT
     750 ENDPROC
     760 :
     770 DEF PROCcarry (X,Y)
     780 MOVE X,Y
     790 DRAW X+64, Y
     800 DRAW X+64, Y+64
     810 DRAW X, Y+64
     820 DRAW X,Y
     830 PRINTTAB(ACX, ACY); carry$;
     840 ENDPROC
     850 :
     860 DEFPROCSpin
     870 Z%=INKEY(delay%)
     880 FOR N%=7 TO 0 STEP -1
     890 H1X=G1X+64*8+4
     891 H1Y=G1Y+32
     900 H2X=G2X+64*8-32
     901 H2Y=G2Y+64*8+64
    910 GCOL 0,0
920 MDVE H1X,H1Y+64*(6-N%)
     930 DRAW H1X+60, H1Y+64*(6-N%)
     940 DRAW H1X+60,GCY+32
     950 GCOL 0,3
     960 MOVE H1X, H1Y+64* (7-N%)
     970 DRAW H1X+60, H1Y+64* (7-N%)
    980 DRAW H1X+60,GCY+32
     990 DRAW GCX, GCY+32
    1000 MOVE GCX+64,GCY+32
    1010 DRAW H2X,GCY+32
1020 DRAW H2X,H2Y
    1030 FOR J%=0 TO 7
    1040 lastJ=(J%+7) MOD 8
    1050 Z%=INKEY(delay%)
    1060 *FX15
1070 GCOLO,0
    1080 MOVE H2X,H2Y
    1081 DRAW H2X-64*8, H2Y
    1090 PROCarrow(G2X+32+64*lastJ,G2Y+32*1
  8)
    1100 GCOL 0,3
    1110 MOVE H2X,H2Y
    1120 DRAW H2X-64*(7-J%),H2Y
    1130 PROCarrow(G2X+32+64*J%,G2Y+32*18)
    1140 carry$=bit1$(N%,7)
Continued ▶
```

YELLOW PAGES GRAPHICS

◄ Hill's listing 5 continued

```
1150 FOR K%=0 TO 6
 1160 bit1$(N%,7-K%)=bit1$(N%,6-K%)
 1170 NEXT
1180 bit1$(N%,0)=null$
1190 FOR K%=0 TO 7
1200 PRINTTAB(hpos(N%,K%)+A1%,vpos(N%,K
%) +A1Y); bit1$(N%, K%);
 1210 NEXT
 1220 PRINTTAB(ACX, ACY); carry$;
 1230 Z%=INKEY(delay%)
 1240 *FX15
 1250 FOR K%=0 TO 6
 1260 bit2$(7-K%,J%)=bit2$(6-K%,J%)
 1270 NEXT
 1280 bit2$(0,J%)=carry$
 1290 carry$=null$
 1300 FOR K%=0 TO 7
 1310 PRINTTAB (hpos (K%, J%) +A2X, vpos (K%, J
%) +A2Y); bit2$(K%, J%);
 1320 NEXT
 1330 PRINTTAB(ACX, ACY); carry$;
 1340 NEXT
 1350 NEXT
 1360 ENDPROC
 1370 :
 1380 DEF PROCheadings
 1390 COLDUR 1
 1400 PRINTTAB(A1X,A1Y-2); "Character Byt
es":
 1410 PRINTTAB(A2X+1,A2Y+18); "Printer By
tes";
 1420 PRINTTAB(ACX-2, ACY-2); "Carry"TAB(A
CX-1, ACY+2); "bit";
 1430 FOR N%=0 TO 7
 1440 PRINTTAB (A2X+2*N%, A2Y+16); 7-N%;
 1450 PRINTTAB (A1X-2, A1Y+NX+2); NX;
 1460 NEXT
 1470 ENDPROC
 1480 :
 1490 DEF PROCarrow(X,Y)
 1500 MOVE X,Y
 1510 DRAW X,Y-60
 1520 DRAW X-8,Y-52
 1521 MOVE X+8, Y-52
 1522 DRAW X,Y-60
 1530 ENDPROC
```

Join the Mandelbrot Set, see page 80

Listing 2. Generates Mandelbrot graphics

```
10 REM MANDEL 1
      20 REM by David Johnson-Davies
      30 REM B/B+/M/E
      40 REM (C) Acorn User May 1986
      50 :
      60 maxcol%=7
      70 MDDE 2
      80 5%=255
      90 DIM C%(S%)
     100 VDU 28,16,31,19,0
     110 INPUT "x,y:" j,k
120 INPUT " s:" q
     130 var=maxcol%/LOG(S%)
     140 FOR N%=1TO S%
     150 C%(N%)=maxcol%-INT(LOG(N%)*var)
     160 NEXT
Continued ▶
```

```
◄ Continued
    170 VDU 19,1,5;0;
    180 VDU 19,2,4;0;
    190 VDU 19,3,6;0;
    200 VDU 19,4,2;0;
    210 VDU 19,5,3;0;
    220 VDU 19,6,1;0;
    230 :
    240 REM Main Loop
    250 Q%=1024: M%=1
    260 REPEAT
    270 L=q/M%
    280 H%=Q%/M%
    290 FOR J%=0 TO M%-1
    300 FOR K%=0 TO M%-1
    310 IF K% MOD 2 OR J% MOD 2 PROCPT
    320 NEXT: NEXT
    330 M%=M%*2
    340 PRINT M%
    350 UNTIL M%=256
360 PRINT "END"
    370 END
    380:
    390 DEF FNm(u,v)
    400 N%=-1:x=0:y=0
    410 REPEAT
    420 y2=y*y
    430 x2=x*x
    440 y=2*x*y+v
    450 x=x2-y2+u
    460 N%=N%+1
    470 UNTIL N%=5% DR x2+y2>=4
    480 =N%
    490 :
    500 DEF PROCPt
    510 x=j+L*J%
    520 v=k+L*K%
    530 PROCgcol (C%(FNm(x,y)))
    540 X%=J%*H%
    550 Y%=K%*H%
    560 MOVE X%, Y%
    570 MOVE XX+HX-1,YX
   580 PLOT 85,X%,Y%+H%-1
590 PLOT 85,X%+H%-1,Y%+H%-1
    600 ENDPROC
    610 :
    620 DEF PROCOCOL (B%)
    630 GCOL 0,8%
    640 ENDPROC
    650 :
    660 DEF PROCecol (B%)
    670 D%=B% DIV 2
    680 E%=(D%+B% MOD 2) MOD 8
```

Listing 3. Creates a 4k disc file of Mandelbrot graphics data

700 GCDL 16,0

710 ENDPROC

690 VDU 23,12,D%,E%,E%,D%,D%,E%,E%,D%

```
10 REM MANDEL2
20 REM by David Johnson-Davies
30 REM B/B+/M/E
40 REM (C) Acorn User May 1986
50:
60 INPUT"File: "A$
70 file=OPENOUT A$
80 INPUT "x,y:" j,k
90 INPUT " s:" Q%
100 S%=255
```

A

YELLOW PAGES GRAPHICS

■ Johnson-Davis's listing 3 continued

```
110 H=Q%/128
120 FOR J%=0 TO 127
130 FOR K%=0 TO 127
140 u= i+H*J%
150 v=k+H*K%
160 N%=-1:x=0:y=0
170 REPEAT
180 y2=y*y
190 x2=x*x
200 y=2*x*y+v
210 x=x2-y2+u
220 N%=N%+1
230 UNTIL N%=S% OR x2+y2>=4
240 BPUT #file,N%
250 NEXT
260 PRINT J%
270 NEXT
280 CLOSE#file
290 PRINT "END"
300 END
```

Listing 4. Reads the data file created by listing 3, processes the point and plots the result

```
10 REM MANDEL3
  20 REM by David Johnson-Davies
 30 REM B/B+/M/E
  40 REM (C) Acorn User May 1986
 50 :
 60 maxcol%=7
 70 DIM C%(255)
 80 FOR N%=0 TO 255
 90 C%(N%)=0
 100 NEXT
 110 :
120 INPUT"File: "A$
 130 file=OPENIN A$
140 FOR N%=1TO 128*128
 150 B%=BGET#file
 160 C%(B%)=C%(B%)+1
170 NEXT
180 :
190 max=(128*128-C%(255))/maxcol%
200 C%(255)=0
210 J%=maxcol%
220 T%=0
230 FOR N%=0 TO 254
240 TX=TX+CX (NX)
250 C%(N%)=J%
260 IF T%>=max*(maxcol%-J%+1) J%=J%-1:
IF J%<1 J%=1
270 NEXT
280 :
290 REM Plot Points
300 MODE 2
310 VDU 28,16,31,19,0
320 VDU 19,1,5;0;
330 VDU 19,2,4;0;
340 VDU 19,3,6;0;
350 VDU 19,4,2;0;
360 VDU 19,5,3;0;
370 VDU 19,6,1;0;
380 H%=8
390 PTR#file=0
400 FOR J%=0 TO 127
410 FOR K%=0 TO 127
420 B%=C%(BGET#file)
```

⋖ Continued

```
430 PROCocol (B%)
440 X%=J%*H%
450 Y%=K%*H%
460 MOVE XX, YX
470 PLOT 1,0,H%-1
480 NEXT
490 NEXT
500 END
510 :
520 DEF PROCecol (B%)
530 GCOL 0,8%
540 ENDPROC
550 :
560 DEF PROCecol (B%)
570 D%=B% DIV 2
580 E%=(D%+B% MOD 2) MOD 8
590 VDU 23,12,D%,E%,E%,D%,D%,E%,E%,D%
600 GCDL 16,0
610 ENDPROC
```

Checksums

David Johnson-Davies listings 1 and 2 (Mandel 1 and 2) provides this month's checksums. Numerous variables are used in the programs so it is possible that you could enter one of these incorrectly thus inhibiting the program's action. If you cannot trace the error 'manually' then use the checksum. You will need the BSUM program provided in First Byte of August 1985 or use the *CHECK command present on the Acon User UserROM (see page 102).

Mandel 1 checksum

Line	Checksu
10	771
20	2460
30	752
40	2006
50	63
60	810
70	324
80	347
90	571
100	929
110	980
120	728
130	1511
140	834
150	2105
160	242
170	748
180	748
190	751
200	748
210	750
220	749
230	63
240	1122
250	709
260	250
270	421
280	461
290	952
300	953
310	1699

Continued ▶

YELLOW PAGES TOPOFTHE LIST

by Alan Crabb

■ Mandel 1 continued

	01 1
Line	Checksum
320	539
330	392
340	395
350	629
360	567
370	229
380	63
390	899
400	862
410	250
420	526
430	523
440	731
450	740
460	394
470	1358
480	183
490	63
500	732
510	571
520	574
530	1590
540	460
550	462
540	574
570	825
580	985
590	1236
600	230
610	63
620	1115
630	467
640	230
650	63
660	1115
670	525
680	1017
690	1746
700	467
710	230

Electron Kevs

Entering Basic programs on the Electron can be a much quicker process because of its single key entry facility. By pressing a combination of keys a corresponding Basic keyword is entered onto the screen and into your program. This program by Alan Crabb allows Beeb users to emulate this useful Electron facility.

There are 29 keywords in all and the keywords on the keys are exactly the same as for the Electron, so anyone using both the BBC and the Electron can still use the single keyword entry on the BBC.

With the utility installed using the single entry is simple. Ensure that caps lock is engaged (the caps lock light should be illuminated), press CTRL and the key on which relates to the keyword needed. To get the usual CTRL effect simply disengage caps lock and the keys have their normal effect (ie, CTRL – U deletes present line).

The routine may be turned off using *CODE 0 0 and re-engaged using *CODE 0 1. To get rid of it permanently type *FX 247 < Return > then press Break. A list of the keys and the keywords they produce is given in figure 1.

The routine works by intercepting the Operating System Read CHaracter routine (OSRDCH). It decodes the value for the character read and if caps lock is engaged, CTRL pressed and the key legitimate, the routine inserts the keyword and Return if OLD or RUN into the keyword buffer. The routine intercepts Break using *FX 247 and re-initialises itself.

How to enter Electron Keys

The program can be entered in the normal way. Save the source program before attempting to run it. Correct any errors that may occur. Take care to enter the keyword data exactly as shown, and all on a single line. The program incorporates a checksum routine that will check that your machine code is correct. All being well you will see the message 'Electron Keys' displayed.

The program assembles from &900 and also requires space in page &A. This area is normally used by the cassette filing system, serial port and sound buffers. If you need to use any of these facilities the machine code will need to be assembled elsewhere. In such cases the checksum will be incorrect.

Mandel 2 checksum

Line	Checksum	Line	Checksum
10	772	200	731
20	2460	210	740
30	752	220	394
40	2006	230	1358
50	63	240	869
60	857	250	242
70	797	260	392
80	980	270	242
90	734	280	678
100	347	290	567
110	465	300	229
120	897		
130	898		
140	564		
150	567		
160	862		
170	250		
180	526		
190	523		

Listing 1. The program enables Beeb users to emulate an Electon facility

10 REM Electron Keys
20 REM by Alan Crabb
30 REM B/B+/M
40 REM (C) Acorn User May 1986
50:
60 start=&900
70 readv=&210
80 uservec=&200
90 osbyte=&FFF4
100 oswrch=&FFEE

110 osrdch=&FFE0

YELLOW PAGES TOPOFTHELIST

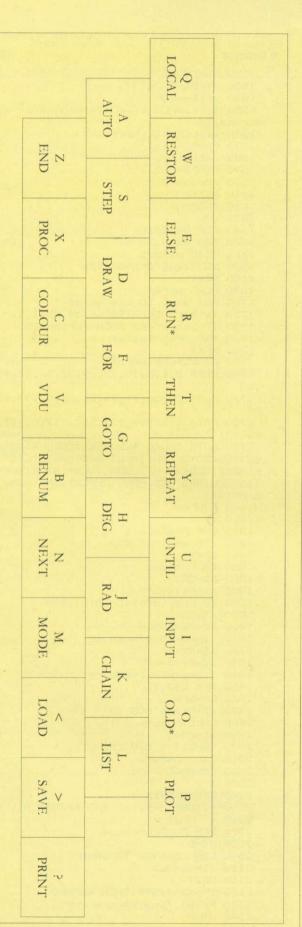


Figure 1 - Electron Keys! See Top of the List

```
■ Crabb's listing 1 continued

       120 PROCassemble
       130 PROCdata
       140 PROCchecksum
       150 PROCstart
       160 END
       170 :
       180 DEF PROCassemble
       190 FOR pass=0 TO 3 STEP 3
      200 P%=start
       210 COPT pass
       220 PHP
       230 BCC end
      240 LDA ready
      250 STA rdch+1
       260 LDA readv+1
       270 STA rdch+2
       280 LDA #rdch MOD 256
      290 STA readv
       300 LDA #rdch DIV 256
       310 STA readv+1
       320 LDA uservec
       330 STA userV
       340 LDA uservec+1
       350 STA userV+1
       360 LDA #user MOD 256
      370 STA uservec
      380 LDA #user DIV 256
       390 STA uservec+1
      400 JSR mess
       410 .end
      420 LDA breakV+1
      430 BPL more
      440 PLP
       450 RTS
      460 :
      470 .more
      480 PLP
      490 JMP (breakV)
      500 :
      510 .mess
      520 LDX #1i MOD 256
      530 .ploop
540 LDA title,X
      550 JSR oswrch
      560 DEX
      570 BPL ploop
      580 RTS
      590 :
      600 .user
      610 CMP #0
      620 BNE notcode
      630 CPX #0
      640 BNE notcode
      650 CPY #0
      660 BNE on
      670 LDA rdch+1
      680 STA ready
      690 LDA rdch+2
      700 STA readv+1
      710 RTS
      720 :
      730 .on
      740 LDA #rdch MOD 256
      750 STA readv
      760 LDA #rdch DIV 256
      770 STA readv+1
      780 JMP mess
      790 :
      800 .notcode
```

810 JMP (userV)

YELLOW PAGES TOPOFTHE LIST

◆ Crabb's listing 1 continued 820 : 830 .rdch 840 JSR osrdch 850 BCS escape 860 STA &70 870 TYA 880 PHA 890 TXA 900 PHA 910 LDA #&CA 920 LDY #&FF 930 LDX #0 940 JSR osbyte 950 TXA 960 AND #&50 970 CMP #840 980 BEQ capslock 990 .return 1000 PLA 1010 TAX 1020 PLA 1030 TAY 1040 LDA &70 1050 CLC 1060 .escape 1070 RTS 1080 : 1090 .fin 1100 LDA #0 1110 STA &70 1120 BEQ return 1130 .capslock 1140 LDA &70 1150 CMP #&1B 1160 BCC letter 1170 SEC 1180 SBC #&10 1190 CMP #&1C 1200 BCC return 1210 CMP #&20 1220 BCS return 1230 .letter 1240 STA &70 1250 CMP #13 1260 BNE word 1270 LDA #&81 1280 LDX #&9A 1290 LDY #&FF 1300 JSR osbyte 1310 CPY #0 1320 BEQ return 1330 . word 1340 LDY \$70 1350 LDA datastore, Y 1360 TAY 1370 LDX #0 1380 .loop 1390 LDA words, Y 1400 CMP #124 1410 BEQ fin 1420 STY &71 1430 TAY 1440 LDA #&BA 1450 JSR osbyte 1460 LDY &71

```
⋖ Continued
   1520 userV=P%
   1530 P%=P%+2
   1540 title=P%
   1550 $title=CHR$13+CHR$10+CHR$10+"syeK
  nortcelE"
   1560 li=LEN $(title+1)
   1570 P%=P%+li+1
   1580 datastore=P%
   1590 P%=P%+&20
   1600 words=P%
   1610 NEXT
   1620 ENDPROC
   1630 :
   1640 DEF PROCdata
   1650 FOR N%=0 TO &1F
   1660 READ offset
   1670 N%?datastore=offset
   1680 NEXT
   1690 READ word$
   1700 FOR N%=0 TO LEN word$-1
   1710 letter=ASC MID$(word$,N%+1,1)
   1720 IF letter=42 THEN letter=13
   1730 N%?words=letter
   1740 NEXT
   1750 P%=P%+LEN(word$)
   1760 DATA 0,1,6,15,22,27,32,36,41,45,51
  ,55
   1770 DATA 61,66,71,76,81,86,92,97,102,1
  07
   1780 DATA 113,117,125,130,137,0,141,0,1
  46,151
   1790 DATA :AUTO:RENUMBER:COLOUR:DRAW:EL
  SE!FOR!GOTO!DEG!INPUT!RAD!CHAIN!LIST!MOD
  E:NEXT:OLD*:PLOT:LOCAL:RUN*:STEP:THEN:UN
  TIL: VDU: RESTORE: PROC: REPEAT: END: LOAD: SAV
  E!PRINT!
   1800 ENDPROC
   1810 :
   1820 DEF PROCStart
   1830 ?(breakV+1)=&80
   1840 C%=1
   1850 CALL start
   1860 A%=&F7
   1870 X%=0: Y%=&FF
   1880 IF FNbyte<>&4C GOTO 1950
   1890 A%=A%+1
   1900 X%=0: Y%=&FF
   1910 ?(breakV+0)=FNbyte
   1920 A%=A%+1
   1930 X%=0: Y%=&FF
   1940 ?(breakV+1)=FNbyte
   1950 *FX 247,76
   1960 A%=&F8
   1970 X%=start MOD 256
   1980 CALL osbyte
   1990 A%=A%+1
   2000 X%=start DIV 256
   2010 CALL osbyte
   2020 ENDERDO
   2030
   2040 DEF FNbyte
   2050 = ((USR osbyte) AND &FF00) DIV &100
   2060 :
   2070 DEF PROCchecksum
   2080 J%=0
   2090 FOR L%=&900 TO &AAB
   2100 J%=J%+?L%
   2110 NEXT
   2120 IF J%=41590 THEN ENDPROC
   2130 PRINT "Checksum error!"
   2140 STOP
```

Continued >

1470 INY

1490

1480 BNE 100p

1500 breakV=P%

1510 P%=P%+2

A

ROM COMPATIBILITY QUEST

Languages	Model I	B 6502 SP	ADFS	B+/128	Master	Electron	Elec+1	Elec + 1 + 3	ROM incompatibility
Basic 1	Y	N	N	N	N	N	N	N	
Basic 2	Y	Y	Y	Y	N	Y	Y	Y	SM NE S TO S
Basic 4	N	N	Y	N	Y	N	N	N	
BCPL	Y	Y	Y	Y	Y	Y	Y	Y	
Comal	Y	Y	Y	Y	Y	Y	Y	Y	UNIX TO THE PARTY
Acorn Forth	Y	Y	Y	Y	Y	Y	Y	Y	
Lisp	Y	Y	Y	Y	Y	Y	Y	Y	
Acorn Logo	Y	Y	Y	Y	Y	·Y	Y	Y	
Logotron Logo	Y		1	1	1	1	1	1	
Open Logo	Y	Y	N	Y	N	NI	NI	NI	
ISO Pascal	Y	Y	Y	Y	Y	N YC	N	N	W. I. Di
150 Fascai	1	1	1	1	1	1.0	YC	YC	Wordwise Plus over use of *FX163
Oxford Pascal	Y		177				1		
Prolog	Y	Y	Y	Y	Y	Y	Y	Y	
Editors	7/4/4					UE TE	18-11-11-11		
Altra BASed	Y		8		111111111111111111111111111111111111111	* 1			
Acorn BASed	Y	100							
Edword	Y		-171620				The State of the S	in the said	
InterWord	Y							E YELLE	
Pro-Word	Y	Y							
		- 2							
Scribe Winner 1 4	Y	N	37	P	THE SECTION				
View 1.4	Y	Y	Y	P					Ultracalc
View 2.1	Y	Y	Y	P		YC	YC	YC	
View 3.0	Y	Y	Y	Y	YS				
Wordwise	Y	Р.							
Wordwise Plus	Y	Y							
Spreadsheets									
InterSheet	Y					Mangett			
Ultracalc 2	Y	Y	Y	Y	Y	Y	Y	Y	
ViewSheet	Y	Y	Y	Y	YS	YC	YC	YC	THE COURT OF THE C
Databases		2107		MAKE I		774			
DataGem	Y		Y	Y					CC Graphics ROM
Interbase	Y		1					N V	GC Grapines ROM
StarBase II	Y	Y						De la legal	
System Delta	Y			Y	Y				CC Graphics ROM (turn off with *FX162,255)
ViewStore	Y	Y	Y	Y	Y				
Utilities									TANK BURNERS
Accelerator	Y	18 July 18			115 115			William I	
Acorn GXR	Y	TASIL	Tente	198	YS		1 1 1 5 1		
Addcomm									Wordwise Plus, Use ?&3A5 = 0/ ?&3A5 = 128 to turn on/off
Addpack	Y	Eligi.		Y				- 1	
ADE	Y								Wordwise Plus over use of *FX163
ADT	Y	STEVE ST							
AMX Art	Y								
AMX Superart	Y								
Beebmon	Y					135097			
BROM	Y			Y					ROM manager (shouldn't need both!)
BROM + Caretaker	Y			Y					Disc Doctor (shouldn't need both!)
Caretaker		le Sulmad							v1.0 Any Rom which uses TAB key
	Y	DEL NEST							
Commstar	Y				N		-		
Crossware Asm	Y	11211	# (K) ()						

by Simon Williams

The Great Acorn User ROM Compatibility Quest has begun (see page 96)! Here is the start of a ROM compatitibility chart that we want you, the reader, to fill in. Let us know of any clashes, no matter how small, that you have encountered. Also, if you know that a certain ROM is incompatible with another then we want to know. Everyone who supplies some information we can use will get a name check in Acorn User.

In addition we want to hear about any prefix characters used by a ROM so that we can build up a table. In addition we're interested in any *FX calls used by any ROM, other than those described by Acorn.

Simon Williams will be coordinating your details so send them to him care of the AU office and mark your letter 'ROM Compatibility'.

This month we're carrying two charts. The first (left) deals with machine compatibility and lists which ROMs will work with which of the Acorn micros, followed by details of any ROM incompatibilities we know of. In some instances a 'fix' is provided! Finally, chart two (page 120) lists letters that commands may be prefixed with to ensure that a particular command reaches the ROM in question.

We propose that ROM commands should be prefixed with the company's intials. In future all AU firmware will allow the use of *AU as a prefix. This avoids use of one prefix character by several suppliers.

So help us to help you - we look forward to hearing from you!

Send entries to: Simon Williams, ROM Compatibility, c/o Acorn User, 141-143 Drury Lane, London WC2B 5TF.

YELLOW PAGES ROM COMPATIBILITY QUEST

	Model F	3 6502 SP	ADFS	B+/128	Master	Electron	Elec+1	Elec+1 +3	ROM incompatibilit
Disc Doctor	Y							13	
Discmaster	Y		71115-1			W. TE. ET.			WE FEW
Dumpmaster	Y	Y		Y	11172	N	N	N	
Dumpout 3	Y	Y							THE PARTY OF
Enigma	Y								
Exmon II	Y	N		P		N	N	N	
Floppy-Wise+	Y								
Fontaid	Y								
Fontwise	Y								
Graphics ROM	Y								
Gremlin	Y		Cons.						
Help II	Y	Y		Y		Y	Y	Y	
Icon Master	Y	Y		Y		N	N	N	
InterChart	Y								MESTINES WILLIAM
Investigator	Y	Marie I			12.344		The bound		
Gemini LBO	Y		Y	Y	1	N	N	N	CC Graphics ROM
Macrom	Y		Y		125	awille i		4 3 1 1 1 1 1 1	
Mega-Rom	Y								
Meta Assm	Y								
BBC Monitor	Y	Y	Y	Y	Y	N	N	N	
Murom	Y	N		N		N	N	N	
NovaCAD	Y	Y		Y					
Pagemaker	Y	N	N	Y*					CC Speech ROM, Disc Doctor, Demon ZROMM, SPQR ROM
Printmaster	Y								
Probe	Y								
Prog Builder	Y								
Replay	Y	N							
Replica III	Y								
Rom Manager	Y	P							
Rom Master	Y								
ROM-Spell	Y	N							
Romas	Y	Y							
Romit	Y	P		Y		N	N	N	
Scythe	Y	P				The life			
Slave	Y	P							
Slave +	Y				W. HV				
Sleuth	Y	N		Y		N	N	N	
Acorn Speech	Y								
CC Speech	Y	Y	Marie Land						
Spellcheck	Y			175131					
SpellcheckIII	Y	Y		Y		N	N	N	
SPY2	Y	P				The second			
Starmon	Y	Y				F 20 11			
Studio Eight	Y								
Tango	Y			Y					
Termi	Y	Р	<u> </u>						
Termi II	Y	Y							
Toolkit Elect	N	N	N	N	N	Y	Y	Y	
Toolkit+	Y					14			
Toolstar	Y	P			33.4			K K L	
Transferom	Y	P		Miles a	***				
Termulator	Y	Y			YS	18 6			
User Dump	Y	Y	Y	Y	Y	P	P	P	
User ROM	Y	NP	Y	Y	Y	YP	Y	Y	
VASM	Y	N		100	*****	72-1			
ViewSpell	Y	Y			1 2 2				
Word-Aid	Y								
Wordease	Y	Y		Y		N	N	N	

Key (blank) – Unknown, information would be welcome. Y – Yes, compatible, though may not use some features, such as shadow RAM. P – Partly compatible, most routines work. N – No, major incompatibility. S – Supplied with machine. C – Cartridge available. * – Shadow Mode off. CC – Computer concepts.

A – ADT, Altra
B – Beebugsoft
C-
D-
E-
F-
G-
H-
I-
J-
K-
L-
M -
N -
0-
P –
Q-
R-
S – Software Services
T-
U – Acorn User
V -
W -
X - AMX
Y -
Z - A&F, Clares
SD - Minerva

A: Chart 2. Letters to prefix commands with to ensure they reach the right ROM

Note

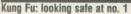
Quoted clashes are not 'blamed' on either party! Some clashes can be overcome by changing the priorities of ROMs.

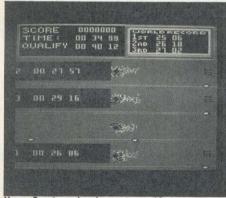


TOP 20 BBC MICRO GAMES

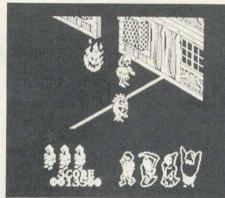
Title	Publisher	Cassette	Disc	B+	Master	Reviewed
1 (1) Yie Ar Kung Fu	Imagine	£9.95	£12.95	No	No	March '86
2 (2) Way of the Exploding Fist	Melbourne House	£9.95		Yes*	Yes*	April '86
3 (9) Citadel	Superior	£9.95	£11.95	Yes	*	March '86
4 (3) Strike Force Harrier	Mirrorsoft	£9.99	£12.99	Yes	No	January '85
5 (4) Repton 2	Superior	£9.95	£11.95	Yes	*	December '85
6 (7) Computer Hits (10)	Beau Jolly	£9.95	-	Yes	No	-
7 (15) Speech!	Superior	£9.95	£11.95	Yes	*	February '86
8 (5) Night Shade	Ultimate	£9.95	_	*	*	May '86
9 (8) Match Day	Ocean	£9.95	-	Yes	Yes	January '86
10 (-) Hyper Sports	Imagine		£12.95	No	No	May '86
11 (10) Gyroscope	Melbourne House	£8.95	£14.95	Yes	Yes	May '85
12 (6) Dr Who and the Mines of Terror	Micro Power	£18.95	£19.95	No	No	March '86
13 (-) Steve Davis Snooker	CDS	£8.95	£12.95	No	*	May '86
14 (19) Phantom Combat	Doctor Soft	£9.95	£11.95	Yes	Yes	February '86
15 (16) Combat Lynx	Durrell	£8.95	-	Yes	*	September '85
16 (-) Spectipede	Mastertronic	£1.99	-	*	No	50 - 10 - 10 - 10 - 10 - 10 - 10 - 10 -
17 (11) Revs	Acornsoft	£14.95	£17.65	Yes	Yes	July '85
18 (12) Bullseye	Macsen	£8.95	<u>P</u> artie	*	*	
19 (13) Waterloo	Lothlorien	£9.95	£12.95	Yes	Yes	April '86
20 (14) Elite	Acornsoft	£14.95	£.17.65	Yes	No	October '84





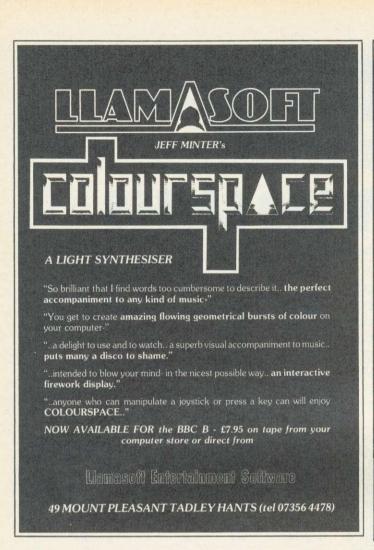


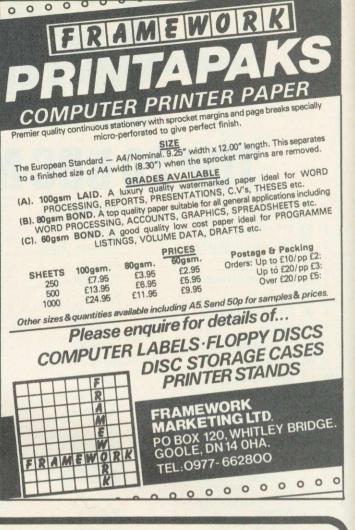
Hyper Sports: swimming up to no. 10



TOP 10 ELECTRON GAMES

Title	Publisher	Cassette	Disc	Reviewed
1 (2) Yie Ar Kung Fu	Imagine	£8.95		March '86
2 (1) Computer Hits (10)	Beau Jolly	£8.95	-	AND AND FRANK
3 (3) Beach Head	Access/US Gold	£8.95		December '85
4 (-) Citadel	Superior	£9.95	-	March '86
5 (-) Spectipede	Mastertronic	£1.99		
6 (4) Repton 2	Superior	£9.95	£11.95	December '85
7 (8) Blockbusters	Macsen	£7.95		
8 (10) The Mine	Micro Power		£9.95	
9 (-) Stockcar	Micro Power	£6.95	V-12-1 19 7-1	
10 (-) Felix and the Fruit Monsters	Micro Power	£2.50		





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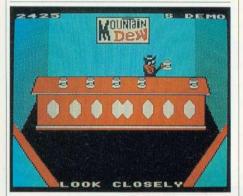
Stevenage, Herts SG2 8RX.

Please supply: MEXICO '86 Electron BBC'B'

Name: Address: Access No. (if applicable)

GAMES

BARRELS OF FUN ON TAP



'Tapper', US Gold, BBC B, £9.95 (cassette or disc)

This arcade game is a barrel of laughs. Several barrels, in fact, because you play a frantic bartender whose job is to keep an evergrowing crowd of customers satisfied. They sidle into various parts of the bar and you have to leap around, filling glasses from the beer taps, slinging them along the bar, saloon-style, and collecting the empties they sling back at you. You lose a life if you keep a thirsty customer waiting too long.

(Actually, the instructions have been carefully edited for the benefit of under-age users, and would like us to believe that it's really a soda fountain and you're only serving fizzy pop. But that doesn't fool anyone.)

As you become proficient, you'll be promoted from the Wild West Saloon to the Jock Bar (patronised not by thirsty Scotsmen, thank goodness, but by sporty people in baseball caps), then to the Punk Bar, with its purplehaired customers, and finally to the Space Bar, full of creatures almost as weird as the punks. In between bars, you can pick up bonus points in an interlude with the 'Soda Bandit'. He shakes up cans of Budweiser – sorry, soda pop – then shuffles them around rapidly. You score by picking the one he hasn't shaken and opening it. If you guess wrong, you're sprayed. Either way, you're soon back in the bar with a hoard of impatient customers.

Sometimes, one of the customers is kind enough to leave you a tip.

If you can collect it without mishap, a pair of dancing girls start doing a can-can and most of

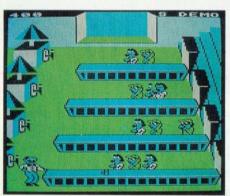
the punters stop drinking to watch – which gives you a breather. It's all good fun and very reminiscent of The Sun, the *Acorn User* local.

The instruction leaflet was obviously printed for an earlier version of the game, for another micro.

It suggests, for example, you can use a joystick on the BBC micro version, which you can't (although you can choose your own keys), and it talks about the two-player game, which also isn't available.

Never mind, it's easy enough to learn to play
but frustratingly difficult to play it well. It's
an entertaining game with a high very
addictiveness rating.

Jeffery Pike



MIXED SPORT



'Hyper Sports', Imagine, BBC B, £14.95 (disc only)

Four things are tested by Olympic games – the speed, and the endurance, of your hands at hammering the keyboard; reaction time to changing events on the screen (like rapidly increasing angles, etc); and accuracy (either by

hitting a target, or by doing something at a precise point such as a take-off line). The very best events are those which can challenge all four abilities and get you to co-ordinate them –



javelin-throwing is a good example. But for the newer games, new events are being introduced – and only a few successfully involve all the challenges of the best Olympic games.

The quality of the six individual events in *Hyper Sports* vary enormously.

By listening to the sound effects, the opening events – skeet shooting and swimming – can literally be played with your eyes closed. On the other hand, the archery offers an intriguing challenge (the wind speed and direction vary, so the event can be different each time you play). The triple jump provides a true test of co-ordinating speed, angle and timing. And the weightlifting is a good challenge to your finger muscles – if you can get that far in the game!

The problem is that the central event, gymnastics, operates on totally incomprehensible principles.

There just doesn't seem to be a 'method' you can master, so your results are completely unpredictable. It's enormously frustrating to fail at the gymnastics each time, and be sent back to the easy opening events, never reaching the later, better games.

And there is no 'practice' way of trying out the various events; you have to play in sequence every time.

In the end, I felt those frustrations and the easy, boring opening games outweighed the really entertaining events. There are three good events, two boring and one that's just plain duff – for me, that doesn't count as enough to be value for money.

Paul Keers

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GAMES

SATISFYING SNOOKER



'Steve Davis Snooker', CDS Software, BBC B and B+, £8.95 (cassette), £12.95 (disc)

Here's your chance to play snooker against the Romford maestro, and even beat him. Steve 'Interesting' Davis apparently endorsed this program, and it must be said that it's a pretty accurate computer representation of the game.

The table is illustrated on screen in mode 2, with green cushions and a black playing surface — which causes a few problems straight away, like how do you show the black ball? (Answer: a white circle, black inside. Similarly the brown is really green and red.) Also, mode 2 graphics only allow fairly rough-and-ready shapes: the balls are chunky crosses.

Before you start, you select the speed of the table (fast, normal or slow), decide whether to play against an opponent or the computer or yourself (good for practising), then, if you're playing the computer, elect just how good your opponent (S Davis Esq) is going to be, from 9 (unbeatable) to 1 (frankly pretty ropey). When it's your turn to pot, you use the keyboard to position a hairline cross exactly where you want to hit the target ball, to define the spin and pace of the cue ball, and to fire.

The results are generally much the same as when I play on a real table – balls rocketing everywhere, the occasional fluky pot, a foul stroke every now and again, and a very rare brilliant snooker. The computer keeps score and does everything else that nice man with the white gloves does, respotting the balls, calling the fouls, asking if you'd like your opponent to play again after a foul stroke, and so on.

The balls don't move round the table exactly like the real thing but, all things considered, the animation is fairly smooth. A bit of sound might help: surely it wouldn't slow things down too much to have a click when balls

collide? It's quite enjoyable to play, fairly frustrating (just like the real thing) and, believe me, immensely satisfying when you land Smug Davis in an unplayable snooker.

Jeffery Pike

LOADS OF CHALLENGES



'Gyroscope', Melbourne House, BBC B and Electron, £8.95 (cassette)

Every so often, you come across a piece of games software which you suspect was much more fun to write than it is to play and here's a case in point. You have to steer a spinning gyroscope across platforms and down ramps, into holes like those on bar billiards tables (hands up those who remember bar billiards). When you've achieved this, you get another screen, with more platforms and more ramps, leading to another hole. And then another one.

The programming is ever-so-clever. The screens look solidly three-dimensional and your gyroscope behaves just as a real one might if you had remote control over it — reacting slowly but surely to a twitch on the rudder (keys or joystick), rolling faster down the steep slopes than the gradual ones, trundling slowly uphill when necessary, and falling off the edge if you oversteer. John Nixon and David Wainwright are to be congratulated for some neat graphics, and a brilliant application of three-dimensional geometry and the law of gravity. But as for playing the game . . .

I just couldn't get excited about it. I couldn't see why I should want to steer a gyroscope into a hole, and thus I didn't care much one way or the other if I made it or not. I'm not sure what it is that's missing, but all the best computer games have some in-built compulsive element which makes you want to go on playing and doing better. This one, clever though it is, simply doesn't.

Jeffery Pike

THE SEQUEL'S SEQUEL



'Nightshade', Ultimate, BBC B £9.95 (cassette)

I enjoyed *Nightlore*, I really did. The advances Ultimate made with its 'filmation' technique were, at the time, amazing. *Alien 8* was more of the same. It was claimed it had a better plot, but it was generally felt to have less going for it. This latest offering changes the backdrops again, offers a few more nicely drawn nasties, but for all that is very much the same as its previous two adventure cartoons.

The cassette sleeve tells of a nightmarish village populated by ghouls and ghosties. All that can save the Kingdom is a weird little fellow in a habit. Guess who controls him?

The game uses the same 3D effects as before, with the interesting development that walls containing doorways vanish as you walk your hero through. It gives the game a more solid feel, and the buildings are very well drawn tudor-panelled affairs.

There's a motley assortment of meanies, some of them brainless and looking like escapees from a Maurice Sendak book, others with a nasty line in zapping you. You have a variety of different weapons (bacteria the blurb calls them), and most of these work on most of the baddies most of the time.

The colour schemes are pretty dull, using no stippling or other screen-enlivening effects, and sounds are few and far between.

The Nightshade cassette comes with a second bonus tape, containing a game rejoicing in the name of 'Head Cleaner'. This one has very poor graphics, no sound (except a peculiar rasping from the tape machine while it's loading), and precious little plot. Seriously, though, it's quite a fun package, but it's about time Ultimate came up with something new.

Simon Williams

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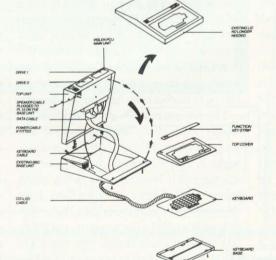
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SOFTWARE

WITH A VIEW TO STORAGE

Alex van Someren delves into Acornsoft's database ROM and decides it's good value for money

ViewStore is the latest ROM offering from Acornsoft in its View family of loosely-connected business software for the BBC micro and Master series. Supplied as a 16k ROM, manual and utilities disc it supports DFS, ADFS and Econet filing systems, although its performance with the latter is decidedly uninspiring except when used with the presently-unreleased ANFS – I'll tell you more about that later.

ViewStore is a fairly sophisticated package, allowing the computer-literate user to set up a good environment for working with databases, and it's certainly one of the best for Acorn equipment currently on the market.

Configuring ViewStore

Like all general-purpose database systems ViewStore needs a significant amount of setting-up before data can be entered and the database put to work. After installing the ROM the user must configure ViewStore so it can find all the various files needed to run the database - it expects to find a database file, a format file (controlling the screen and data formats) and usually a number of index files. Each kind of file must be stored in a different directory, each named with an initial letter, eg, 'D' for the database files. The Prefix command establishes where the directories D, F and I (and others) are found on the current filing system, so for example, one might set the Prefix for the database files to be ":0." whereupon ViewStore will always search for a database file by trying to open ". D.databasename". This arrangement is a little unnecessary when using hierarchical filing systems such as the ADFS or Econet, but can save a lot of bother when using ordinary floppy discs. In this way ViewStore manages to accommodate all Acorn filing systems and any number of disc drives with minimal preamble, though a boot file is definitely required!

Once you have set up the system using Prefix, ViewStore expects you to estimate and enter the amount of space needed by the database overall – the number of records you expect to have, the number of indexes, their



ViewStore's spreadsheet display mode

filenames, and the index key sizes – using the Setup utility supplied. This process shows how ViewStore suffers from Acorn's past mistakes: if, while answering Setup's questions about the expected size of the database, you fail to provide sufficiently over-estimated answers, the DFS will come up against 'Can't extend' errors. On the other hand the manual says that the system operates (ie, after setting up) more slowly with larger files, probably due to the indexing technique used. Since the only cure for such errors is to compact the disc, it appears DFS users will have to suffer slower systems until they upgrade to ADFS, where such problems do not occur.

Finally, before you start entering data, *ViewStore* wants you to tell it the names, types, sizes, constraints and prompts associated with each field of a record, along with a variety of optional information which depends on the specific kind of field. Data types available are alphanumeric, textual, numeric (eg, floating-point) and two date formats (English and American). Alpha and text types have a 'Scroll flag' which allows them to be larger than the available screen space. The distinction between these two types is abysmally glossed over in the manual, and proves to be quite important.

Numeric data has a decimal places control, and all types can have lower and upper limit constraints, eg, earliest date or highest letter of the alphabet. Each field can have a prompt, displayed at the top of the screen when the cursor is on that field, and you may also supply

a value list which restricts the data allowed to be entered into the field to entries in the list. There are also several options for indexing.

If this preparation process sounds daunting, then rest assured – it is! But, like most softwa e, it soon becomes second nature and after creating five or six different databases I find the whole process takes about 15 minutes.

Once the formalities have been completed, ViewStore is ready for you to enter data onto the screen. ViewStore uses two screens in much the same way as View does, Escape toggling between them. The data screen can be in one of two formats, either 'spreadsheet' or 'card'. The former shows one record to a line, with fields arranged as columns, and scrolls sideways (almost) infinitely to accommodate fields that are not immediately visible. The latter permits you to layout fields in a pseudo-cardbox style, possibly more useful where you want to keep many fields visible at once. This layout must be designed with an unpleasantly simplistic editor which spoils the card display for me to the extent that I don't bother to use it.

ViewStore thinks very hard when you enter data, a fact exaggerated by the time lag between typing things into fields and them actually appearing on the screen. While the delay is not long in real terms, it is more than perceptible and therefore rather irritating. That aside, though, I'm delighted to say that entering data is simplicity itself. The use of a boot file saves time and tears at switch-on, but beyond that stage a child could do it!

Database usefulness

The ultimate usefulness of any database comes from its indexing capabilities, something which *ViewStore* is not short of. An index can be created for any field in a record, or for several at a time, depending on how they are created. You may use the Index utility to create a one-off index for a field whenever you wish, but when more data is added the index instantly becomes out of date. To overcome this *ViewStore* can maintain indexes on several fields at a time automatically, the exact number being determined by the filing system in use.

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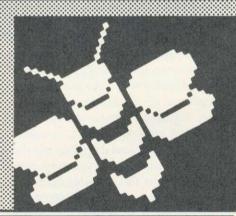


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performed by this module you can also obtain

valuable management information such as debtor

lists, which can be printed together with telephone

The stock control module is used in conjunction

whenever an invoice is issued. It is then possible

stock or re-order level items. Purchase orders can

As with the Accounts Receivable there are many

enables you to identify slow or fast moving parts

A parts explosion option is also available for just

A twin double sided drive is required for the

STOCK CONTROL module

Ask for a full data sheet

to automatically search the stock file for out of

with the invoice program and is updated

then be printed, automatically if required.

forms of management information available

including stock numbers and values both numerically and as a percentage figure. This

the outstanding account.

picture of the position.

MODULE

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STOCK CONTROL

the accounts receivable file and allocated against

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SOFTWARE

The DFS and NFS can maintain four indexes, while ADFS can support nine.

The speed (or rather sluggishness) of the system is directly in proportion to the number of indexes being updated, and with more than two the delays mentioned above become even more disturbing.

Records may be ordered on screen by means of any index (including out-of-date ones), allowing instant checks for duplications and gaps. The value of this facility should not be underestimated, as a corrupt database is a useless database!

Select utility

Once up-to-date indexes exist, ViewStore allows more sophisticated record selections using the Select utility. This allows you to generate either a printed list of a subset of the database, or to generate a new database containing that subset, thereby allowing further processing. All the utilities except Select and Setup can use such a file as their source data.

After a few preliminaries Select asks for the selection criteria, of which there can be any number. Each criterion must evaluate to a Boolean value (eg, NAME="Alex", whose value here is TRUE), and the criteria may then be strung together using the Boolean operators AND and OR. To permit complex selections *ViewStore* allows the criteria to be entered over several lines, and multiple bracketing is permitted so the order of evaluation can be forced. Single and multiple character wildcards are allowed, and an option also exists to truncate the amount of a field used in a comparison.

When generating a file of selected data *ViewStore* also asks for the fields by which you wish the resulting records to be sorted. Again, there can be any number of sort fields, so long as 'the total number of characters used in the comparisons is not greater than 250,' whatever that means. The sorts can be performed in either ascending or descending order.

I found the Select utility very easy to use, though it is fairly poorly documented. The distinction between the alphanumeric and textual types is that in the former case the whole field is used in the comparison, whereas in the latter case each word in the field is compared individually. In this context ViewStore defines a word to be any number of characters bounded by spaces. I only discovered the three lines discussing this in the manual as I was writing the review, and this highlights the lack of a summary of the

selection commands, a serious omission in discussing an area which much of the system revolves around.

The 'select file' produced by the Select utility can be used by some other utilities to produce formatted output and link *ViewStore* with other members of the *View* family.

The Macro utility translates a select file into a series of *View* macro lines, one per record, which may then be read into *View* to provide data for labels, form letters, etc. Macro simply asks the user to enter the order in which the fields are wanted in the macro to be generated, and requests a name for the resulting file.

The Link utility performs a similar function for transferring data to *ViewSheet*. Again, you may specify which fields you wish to transfer and in which order, followed by a filename which is usually of the form "V.VSn" (n=0-255) to be compatible with *ViewSheet*'s Read facility. The Link utility is not as comprehensive as Macro in that it can only transfer numeric fields, a little surprising knowing that *ViewSheet* accommodates labelling of rows and columns and that the field names are readily available from *ViewStore*.

No prizes for divining the purpose of the Labels utility, which is a short-cut to avoid using Macro and then having to go into *View*. The numerous options ensure that nearly every size and shape of continuous label stationery can be used, and a nice touch is the 'Alignment print' option, which allows you to make a mess of reams of labels in order to get them aligned before printing a full set. Anyone who has printed labels more than once or twice will understand what a good idea this is!

The fiendishly useful Import program is actually a chunk of Basic and machine code which converts foreign data formats into ViewStore databases. It requires a good deal of preparation before use, such as finding out how records are delimited in your source file and so forth. I have persuaded it to create databases out of everything from View macros (the opposite of Macro!) to corrupted ASCII text files. It asks you nearly 20 questions before it goes off to process your file, and I find it hard to imagine any format which it couldn't cope with. Several examples, dBaseII among them, are included in the manual. It's not fast but it's a blessing for anyone who is already using other database systems.

Finally, the Report utility is a simple prettyprinter which works in very much the same way as macros do in *View*, ie, fill in the blanks. Headers, repeated on every page, are supported as are both textual and numeric blankfilling. Basic arithmetic is permitted, and two levels of registers are available for performing sub-totalisation. Using these registers ViewStore will print out sub-totals each time the value of a specified field changes, producing neatly formatted listings with totals in

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A record-type definition menu

places one might instinctively put them – a very nice touch.

Conclusion

ViewStore is a fairly comprehensive database management system, and it fits loosely but tidily into the network of data transfers within the View family. It is certainly the most comprehensive database management system available for Acorn equipment that I have encountered, but it still has a long way to go before we can compare it with some systems for other machines – still, what can you expect for several hundred pounds less?

Using ViewStore on the Econet is a complete write-off unless you have ANFS or are using a file server from SJ Research. The reason for this is beyond the scope of this review, but it has to do with the history of the Econet software. I strongly suggest you try it out before you buy it for network use, particularly as Acorn currently has no information on when the ANFS will be released.

If you are lucky enough to have an ADFS disc system, either floppy or hard, *ViewStore* is very much easier to use. Using it with the DFS is a chore which should really be reserved for misers and masochists.

ViewStore is not fast, but if you trade this off against its sophistication I think you'll agree that it's excellent value for money.

ViewStore £59.80 inc VAT Acornsoft, 645 Newmarket Road, Cambridge CB5 8PD. Tel: (0223) 214411

SOFTWARE

MAKE-UP FOR MORTALS

Tony Quinn relives the joys of working on newspapers in the first of two reviews of publishing software

Two names have been on everyone's lips for the past six months: Mirrorsoft's Fleet Street Editor and Pagemaker from Advanced Memory Systems (now in a 'Super' version which doesn't need the AMX Mouse chip). I'm going to deal with these in two parts, with Fleet Street Editor coming first and the AMS offering next month. They both have major failings which decry their ability to achieve their claims, but I have no doubt that they are a major step in software publishing, and it is yet another tribute to the quality of the BBC micro that they appear on it first.

Fleet Street calls to you through advertising pages with 'professional-looking printed materials' and the jargon of newspapers. AMS waxes just as lyrical with 'a revolutionary software program that will produce newspapers... to an extraordinary professional standard.' The adverts then go on to quote words like 'phenomenal' and 'outstanding' from an Educational Computing review.

So, after reviewing the hype, what are the programs really like? First, they are both restricted to an A4-size page (the size of this

magazine), and I'm still waiting for a paper from Murdoch, Shah, Maxwell (under whose wing Mirrorsoft lives), or anyone else which is that small. Next, they both suffer from appalling typefaces, the standard of which takes me back four years to the crude styles of early printers, because text has to be handled in the same way as graphics. This means neither can use the near letter quality (NLQ) typefaces of today's printers, which is a pity.

The set-up

Before you turn to the Advertising Standards Authority, let's go through the capabilities of Fleet Street. The software was written for Mirrorsoft by Clares, a company renowned for programming through its many utilities. The manual is an A5 ring binder with a folder containing two discs (which are a tight fit in a plastic wallet) and a function key strip neatly tucked into the back. This is a big advantage over Pagemaker, as you can literally put Fleet Street in your pocket. No ROMs are needed, and the program can be controlled from keyboard or joystick – but not from a mouse.



Figure 1. One page out of the 42 in the graphics library. I took the woman for the 'Stun' page, and loaded her into the Studio (figure 3). Here I added a background, changed her face and added the headline text

To a son of the sun in the Sun in

Figure 2. Result of using the 'guided tour' files. All the material except the 'Groucho' panel is provided. The banner is a 'stretched' panel

The manual is well-written, indexed, and full of diagrams, but it has some annoying characteristics. The first is a mass of pages on topics like newspaper and computer jargon and worthy but wordy chapters on the publishing process.

I don't think I'm alone in wanting to get to the nitty gritty, rather than skim through what I already know. Of course the package is complex and sophisticated, so you have to read something to get going, but it would be good to show people in a more obvious way which bits are and are not vital.

The numbering system for pages and paragraphs can be a bit confusing, but it's been done this way so that Mirrorsoft can send out new or corrected pages without having to renumber the whole manual.

The first thing to do is to tell the system disc what sort of computer set-up you have – printer, disc drives, etc. In doing so, you have to learn a new set of disc jargon because *Fleet Street* uses 'flippy discs' which you actually have to turn over. This might be confusing for less-experienced users, but Mirrorsoft assured me they had had no problems. I got my system set up wrong the first time, but it's not hard to

SOFTWARE

do it again. My advice to the uninitiated is to find someone to help you. You then prepare some 'user discs' with a very handy format and verify utility.

Once the system is set up properly, your best bet is to go through the 'guided tour' where most of the work is already done for you. You create one panel out of the eight which make up a page.

The guided tour

The tour introduces you to each of the five elements in the system: graphics library, studio, copydesk, page make-up and preview/print. It works like this: you enter the library (figure 1), select one of the 200-odd standard graphics (I chose Groucho) and save it to disc.

You then enter the studio, load in the saved graphic, play around with it by expanding the size (I doubled the height), and save it to disc. There are many other goodies in the studio, allowing pictures to be altered and even creating your own from scratch, but I'll come to these later. Note, though, that pictures can't be



Figure 3. The studio for creating or altering pictures and headlines. Icons choose pens and fills, disc, copying and rotating facilities and pixel editor

loaded in straight from the library.

You now leave the art department and enter the copydesk. Here you load in the saved graphic, and put words and headlines around it. The words part of the package I found disappointing, as the text editor is crude compared to a wordprocessor (*Pagemaker* doesn't have one at all) and you can only get 32 characters (about five words) onto a panel line and there are just 23 lines to a panel. This means lots of white spaces when you justify text. The typeface is poor, being based on an eight-by-eight matrix, whereas printers use at least nine by seven.

You then save your text and graphics which is by now a fully-fledged 'panel' – the time has come to enter the page make-up area where the





ANDY'S EX-GIRL IN BATH SHOCK



by Michael O'Shea

PRINCE ANDREW'S former model girlfriend, 27-year-old blonde Sarah Brown, narrowly escaped death yesterday when her bath-room caught fire.
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To a son of the sun in the sangaroo down sport, tie me kangaroo down this message is for

provided the sun to go back to the sun. For sun, and now rarely the see.

has nof the Australian rarely the sun does

FLOOK with apologies to Trog



and Keith Waterhouse



Figure 4. 'Stun', the result of about a day's work on Fleet Street. All eight panels were done from scratch, apart from Sarah Brown and Groucho from the Graphics Library. Note that the horizontal rules cannot be carried across the central 'gutter' between the panels: the vertical rules do join up, though

designed panel is put in position on the page. Once this is done you have a completed 'page' so you save it to disc.

Finally, you leave make-up, and enter the print section. The page is loaded back in and can be previewed, which gives you a rough idea of how it will finally look (it's about half-size). Previewing takes about a minute and a half, and if you're happy, printing takes another three minutes. At last you have a printed

page – my effort is figure 2. Now if that sounds convoluted, let me confirm that it is – I would be astounded if anyone got it right first time. And if you have printer problems (as I did with a Mannesman Tally MT85 which has to have a line feed set up), you have to go all the way back to the set-up stage!

After working my way through the tour and having a go with the studio, I realised the system just didn't seem to agree with me.

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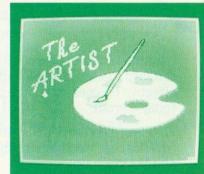
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SOFTWARE

There are niggling little things, as with any software, but there are some fundamental design decisions which annoyed me. One was the laborious way of saving pictures. There are different ways of saving for the sections you visit and each one has several stages.

Readers who use wordprocessors will appreciate the need for regular saving of text in case of pressing Break accidentally, or losing power, but *Fleet Street* makes this a real pain: it's complicated and time-consuming. For example, if your graphic fills the whole screen, it's a real art framing it for saving, and if you go outside the page area you have to start again. There is no default for saving the whole screen, which there should be to encourage regular saving.

The idea of using panels is quite simple, but limiting. Each panel is a set size, so if your page design doesn't neatly fit into eight parts you are in for some trouble. I had this problem in creating the 'Stun' page, where I couldn't join up the rules to make the box (figure 4). Of course it's easy to draw in with a pen on the



Figure 5. The Groucho panel has been taken from the studio to the copydesk, where the words are added. Note the choice of type fonts in the top right

printout afterwards but goes against the grain. Another limiting factor is that the package only allows two columns of text (*Pagemaker* allows more). Going back to the newspaper analogy, show me a paper working to this rule! However, I found out later that Mirrorsoft had worked out a way to do it by setting up a graphic for each half of a panel, and writing over it in the copydesk.

By getting to know *Fleet Street*, I'm sure many of these limitations will become 'features', and in time ways around them will be found – for which the promised newsletters will be vital. Mirrorsoft is also set to bring out three support discs by May. One will contain extra graphics, a text font editor and 10 more fonts; the second will be full of Walt Disney

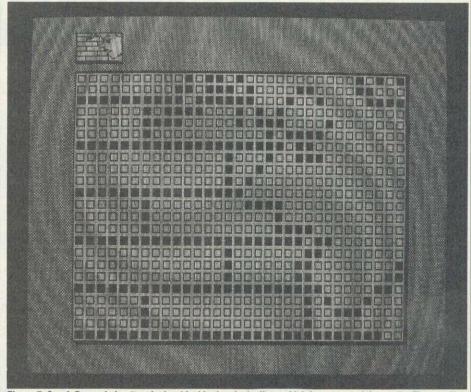


Figure 7. Sarah Brown being 'touched-up' inside the pixel editor, which forms part of the studio. The scrolling on this has to be seen to be believed

characters; while the third will be a utilities disc. Mirrorsoft is also working on a 'wire room' with the package linked to a cheap picture digitizer and modem. It is this level of support from Mirrorsoft (and third parties I imagine) that will really get the package going.

With all this in mind I set out to put the system through its paces by doing a mini tabloid front page, and the 'Stun' page of

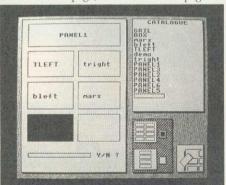


Figure 6. Page make-up: panels are pulled in to make a page. The Y/N question refers to whether the panel is to be 'stretched', as in figure 1

figure 4 was the result. The girl was taken from the library and touched up – she originally had a chin like Frank Bruno – using the excellent pixel editor (figure 7) in the studio (the scrolling speed has to be seen to be believed). The background was added to form the picture for the lead story. I used Groucho for a second story and then started from scratch on the Flook cartoon.

The end result

The end result is neat and impressive, but is it any better or quicker than using scissors and paste? With long documents I reckon you're better off with a good wordprocessor and printer because the text is so much better. However, if you want to produce one-off leaflets with lots of graphics you can have a great deal more fun with *Fleet Street*, produce very clean pages and it's an impressive package for £40. The graphics library and studio are worth using as an addition to cut and paste.

Next month I'll tackle Super Pagemaker from AMS with their Mouse and give a final summing up of the merits of these two publishing packages. We look forward to seeing the results readers can achieve with Fleet Street and Pagemaker.

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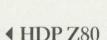
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ACORN USER MAY 1986

OFTWARE/ROMS

FOUR PLUSES FOR WORDWISE

Patrick Quick looks at four utility packages for Wordwise Plus

Since Wordwise Plus was published last year more and more 'segment programs' (or sprogs) have appeared in magazines and many users have written their own. They are easy to write and can be very useful, so it was only a matter of time before packages of utility sprogs were published. This review covers four such packages, three on ROM and one on disc. Watford Electronics' Word-Aid ROM and Beebugsoft's WordEase disc each offer a mixed bag of general-purpose utilities with no strong theme. Norwich Computer Services' Continuous

Processing ROM (CP-ROM) contains a suite of sprogs aimed specifically at making it easier to spread a document over several disc files. Interface Electronics' Wordwise++ ROM is different. Its main offering is extra string handling commands for Wordwise Plus, programmed in machine code, but it also includes a few general sprogs for good measure.

WordEase

This 40/80 format disc contains around fifteen different utilities, selected from a menu. The

range is wide and many are good and wellprogrammed with plenty of user-friendliness and flexibility, but one or two are a bit too slow to be useful. I am already using the 'auto version save' for this review, and the label printing and mail-merge look flexible. The 'section renumbering' automatically handles numbered paragraphs of the 5.3.1, etc, format and also amends all cross references to paragraphs. I don't know how useful this is likely to be to you but I don't use that type of numbering and if I did it would probably be on

a document too big to fit in memory.

Beebug has the advantage over the others in offering its product on a disc, which allows a lot more space for messages and clear prompts and a wider range of routines (WordEase fills about 32k of the disc). It was also fairly easy to add my own routines into the menu structure. especially after using WordEase to expand the abbreviated keywords in the menu sprogs. I can see myself using this package as the basis of my own compilation of sprogs. A poorer decision made by Beebug was to put the main menu in segment 9. Pressing Shift/f9 all the time is a bit dangerous for my liking, f9 being so close to Break. I did, though, like the fact that Beebug clearly states that users can make one backup copy of the disc for their own use.

Word-Aid

Like WordEase this package offers a selection of sprogs, but this one's in a 16k ROM which rather limits the space available. Slightly fewer options are given and many are trivial and inflexible. The printer codes, label print and mail merge are inferior to the ones from WordEase and the continuous processing options come nowhere near the sophistication of Norwich's ROM. The only things that scored over the others were the multi-copy printing routine (I had already written one myself and can't imagine why everybody else left this out) and the sorting facility. Overall I found Word-Aid insubstantial - I would want something much more impressive before sacrificing a valuable ROM slot or the cash, especially as on ROM you cannot make even minor amendments to the routines. I have just noticed that Watford is offering Word-Aid free with Wordwise Plus in their January 1986 advertisement - at that price I suppose it's not bad.

COMPARISON TABLE					
	Word-Aid	WordEase	CP-ROM*	WW++	WW++ disc
Compact sprog	To the second	3	The state of the s	3	3
Analyse sprog	miss =	3			3
Text transfer	3	3			4
Clear segment/text	3		HELL BY		P
Display variables	_			2	P
Show seg/text status		1			
String functions				5	. N -
Printer codes	3	3			P
Multiprint	3				
Printer symbols		. 3			
Stored page layouts	_	1			
HR1 exclamation				1	P
Continuous proc: select	3		5		
Continuous proc: print	3		4		
Address finder	2				
Label print	2	4		2	P
Mail merge	2	3	_	2	P
Basic line numbers	3				P
Split Basic lines				3	
Disassembly labels				4	P
Auto-version save		4			5
Disc menu		3		3	3
Function key edit		3		2	P
Renumber sections		4			
Align numbers		1			
Sorting	4	3			P
Mark chapter	1				
Search and replace	3	3	3		
Remove embedded cmnds	3	3	The state of		P
Alter preview mode		3		1	r
OVERALL			-	1	
Ease of use	2	3	4	4	3?
Facilities	2	3			
Value for money	2	3	3	4	3?
			3	3	5?
Price (inc VAT/p&p) KEY: 1 = poor, 2 = bearable,	£19.55	£21.50	£15	£19.95	£1.50

KEY: 1 = poor, 2 = bearable, 3 = good, 4 = very good, 5 = exceptionally good, P = promised *Now replaced by CP-ROM2 at £25

SOFTWARE/ROMS

CP-ROM

CP-ROM contains a suite of sprogs to enable a single document to be spread over several files on one or more discs. There are two advantages to this facility: one is that your document can be almost any size, limited only by disc space rather than RAM space, and second, even for a document that fits into RAM, by splitting it into smaller sections you can preview it in 80 columns. The second advantage can be obtained for smaller documents by fitting a 'shadow' screen RAM board (such as the Aries B20) or adding a second 6502 processor. However, neither of these will give you much more total space for your document.

CP-ROM keeps a file called !FLIST on disc which contains a list of the files in use, including (if necessary) the drive number and directory for each file. !FLIST also keeps a note of the current file in the list so that when it restarts, CP-ROM loads the last file you were using. Switching between files while editing is easy (but not automatic). Printing, previewing and search and replace can be performed over the whole document at once. This is not as convenient as having a wordprocessor specifically designed to edit large documents but it is not bad as most large documents break down naturally into chapters anyway.

Basically *CP-ROM* works as promised. The only small problem occurred when printing several or all of the files. The current file was printed as the version on disc, not the possibly different version in RAM, although this RAM version was preserved throughout the operation. The sprogs are in ROM Filing System (RFS) format on an 8k EPROM which seems a bit tight now that 16k EPROMs have become so much cheaper.

In fact *CP-ROM* has just been replaced by *CP-ROM2*, offering 16k for £25, featuring multiple disc documents of unlimited length, 80-column preview regardless of file length, 10 pages of help information, improved previewing, printing and formatting facilities, and enhanced file list manipulation.

Wordwise + +

Wordwise++ (aka String Extension ROM) contains a set of functions to extend the string handling in Wordwise Plus sprogs which are made available just as though they were in the Wordwise Plus ROM. Wordwise++ works intimately with the Wordwise Plus ROM, intercepting the error vector, so you must have the correct version to match your Wordwise Plus.

The 24 functions offer substring (including

LEFT\$, RIGHT\$ and MID\$), padding, search and replace operations on strings (you can do these things in Wordwise Plus but they are slow). All in all they seem to be a well chosen set of enhancements to Wordwise Plus's string handling facilities. As an example, the function LPAD\$(B\$,":",10) in sprog 1 below means 'pad out B\$ on the left with colons to a total length of 10 characters', ie, B\$ becomes ":::::HELLO". Sprog 2 does the same job using standard Wordwise Plus commands, while sprog 3 executes the empty loop to find more precise timing figures.

The timings (in milliseconds per loop) are: sprog 1 = 185ms; sprog 2 = 1045ms; sprog 3 = 73ms. Thus the LPAD\$ loop took 112ms whereas the 'straight' *Wordwise Plus* version

```
C) Beebugsoft 1985 Free:
21802
A. Auto-Version Save $605
B. Basic Status
C. Copy Segment to Segment
D. Disc Menu
E. Edit Text/Segment
F. Function Key Editor
G. Gen Utils (Strip/Renumber/Align)
H. Hardcopy Codes
I. Individual Symbols
J. Standard Page Handler
K. Program Utils (Analyse/Compact)
L. Label Printer
M. Mail Merge
T EXIT to Text Text
O-9 EXIT to Segment
W Wipe Seg/Text
W Change Drives Util=0 Other=0
Select Option ___
```

WordEase: well-programmed and flexible

took 972ms, over eight times longer! You cannot expect an eight-fold improvement in all cases but this ROM should speed things up considerably as well as making 'sprogramming' easier.

Wordwise + + also has four 'star' commands and six utilities in RFS format. The star commands offer function key definitions, single key file selection from disc (nice, especially the auto-boot option), alteration of default preview mode (why?) and printout of all Wordwise Plus variable values. Five of the RFS utilities are sprogs – in particular, there is a dissassembly labeller. I've wanted one for years and have never seen one anywhere else. The routines for label printing and mail-merge are rather minimal. The last RFS file is a short machine code routine to make a Brother HR1 printer produce exclamation marks.

I am told that copies of these RFS files, together with a few more utilities, are due to be put onto a disc which will be available soon at a nominal cost of £1.50 inc. This disc is no use without the Wordwise++ ROM as the new string facilities are used. The sample I have been sent shows a similar range of utilities to

the Watford and Beebug offerings except, of course, that the string extensions are used to give shorter, faster utility sprogs.

Overall

I was pleased to find that the manuals for all of these packages were fairly clear and easy to use although the *CP-ROM* manual was wordy.

These utilities are the first examples I have met of RFS files and I am astounded at how slowly they load! Normal ROM utilities (Wordwide Plus, Disc Doctor, etc) are extremely fast but RFS files seem to use a separate ROM service call for each byte read. A hard disc over a network should be much faster than RFS files. WordEase is not constrained by lack of space and is easily amended; neither does it use up a valuable ROM slot in your Beeb.

On the other hand, with the ROM based packages you do not have to find your utility disc before starting or keep copies on each wordprocessing disc you have.

None of these 'Wordwise Plus assistants' will work fully over a network. Both Word-Aid and WordEase select the discs for you with *DRIVE commands. However, it should be possible to amend WordEase to avoid this and to keep the main utilities in a library directory. I don't know what Beebug's attitude would be to this but I believe it is generally willing to consider network usage of its software. All three ROM-based packages reselect disc (with *DISK) after loading utilities from ROM. The main features of Wordwise + + work completely within the ROMs, so a network should present no problems.

In summary, then, I cannot recommend Word-Aid as it is bettered in almost all respects by the others. Each of CP-ROM and Wordwise+ + attack their chosen area accurately and can be recommended if you feel the need for their particular facilities. WordEase, although rather pricey for a fairly straightforward set of utilities, should be a good buy, especially if you can adjust the routines to suit your own requirements.

WordEase (disc)
Beebugsoft, £21.50 inc p&p & VAT
Word-Aid (ROM)
Watford Electronics, £16 + p&p (min. £1) +
VAT = £19.55
Continuous Processing ROM2 (CP-ROM2)
Norwich Computer Services, £25 inc p&p & VAT
Wordwise + +
Interface Electronics and Computing, ROM £19.95 inc
p&p & VAT, disc £1.50 inc p&p & VAT



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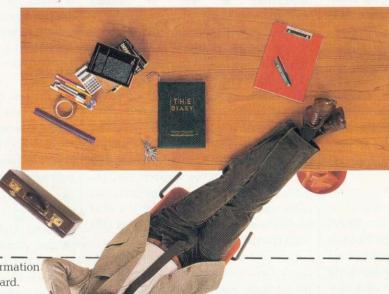
Small Mammal Survey This interesting project

relates to the habits of smaller mammals in their natural habitats. The student is able to set traps, mark the animals and release them in order to obtain information about population distribution, growth and habits.

Several weeks of intensive fieldwork would normally be required to undertake this type of study. The Concept Keyboard may also be programmed for special class projects of any type, involving students in the preparation of overlays and input of ideas.

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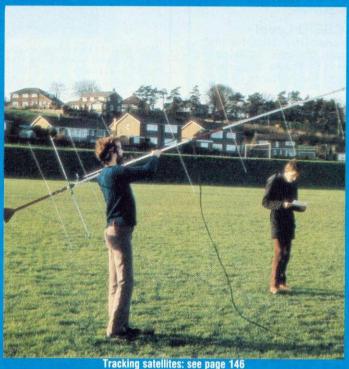
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Telephone Number		

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The IMAGE III Frame Store turns your BBC computer into a low cost image processing system and opens up a range of possibilities such as Robotic Vision, Medical Imaging, Factory Inspection, Microscopical Analysis etc. Alternatively the store can be used in applications where picture data is arriving slowly, eg weather satellite transmissions, ultrasonic imaging, enabling the user to have a steady display without the need for long persistence display services

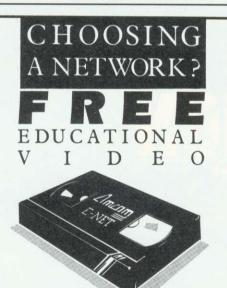
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NEWS

Micro unit on the move

Micro-Robotics of Cambridge has developed a new micro controller.

This compact device may be programmed from a variety of computers and then left to operate independently. It has its own high-level resident language, designed specifically for control applications, which is simple to learn for anyone with previous Basic or Logo programming experience.

The unit runs independently of a power source since it carries batteries, which means that where portability and movement are important the unit has the flexibility to go where computers cannot.

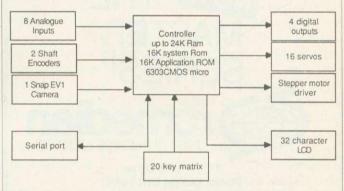
Teachers have long bemoaned

children's preconception that a computer is a box with a keyboard on it.

This unit will help to dispel that myth and its great versatility will be proven by the flood of applications it will generate.

Optional extensions to the controller include a 20 character detachable keyboard, 16 character two-line LCD display, a range of sensors, servos, buzzers, the Snap EV1 camera, stepper motor driver and many more.

It costs £195 and details are available from 264 Newmarket Road, Cambridge CB5 8JR. Tel: (0223) 32310.



Micro-Robotics micro controller is suitable for use in a variety of situations

Set your own speed with Slomo controller

The Slomo Micro Speed Controller from Nidd Valley Micro Products enables teachers to slow down and freeze programs. It operates by giving interrupts to the central processor and fits into the Tube interface on the underside of the machine – for people with second processors an adaptor links the two devices. A version is also available for the Electron.

Teachers will find this of great use in a variety of applications: where a pupil has special needs and is unable to cope with the frenetic speed required for some programs, this device will allow him or her to work at an even tempo. Moreover, when demonstrating using a computer to a class, a teacher often wants to pause and freeze the action.

Mice

Also available from this company are two mice – the Anamouse and the Digimouse. The first is connected to the analogue port and is easily programmed using the usual ADVAL commands. The second is more conventional and will be compatible with both the AMX Mouse and Wigmore Megamouse software.

Details from Stepping Stones House, Thistle Hill, Knaresborough HG5 8JW. Tel: (0423) 864488.

Teach-in on telephones

How do you teach a child how to respond to an emergency? What is the most effective method of training in the use of telephones?

Primary Programs think it has the answer with *Phonin*, its telephone skills package, developed in conjunction with MEP. The package comes complete with a British Telecom telephone (dial variety) and a connector to the analogue port. The software may be used with a Concept Keyboard.

A variety of tasks is undertaken including accurate dialling, dealing with emergencies, using directories and information services.

At all times the computer is used not only to monitor the child's accuracy but also to provide the motivating force behind the simulation. A payphone option is also available.

Details are available from Primary Programs, Claypits, Debden Road, Saffron Walden, Essex.

EDUCATION TOP FIVE									
	Title	Publisher	Cassette	Disc	ROM	Electron	Shadow on B+	6502	Econet
1	Maths	Longman	- f.	17.50-29.9	5 *				
2	Best 4 Language	Ask		€19.95	5	Yes	Yes	-	
3	French Mistress		€,8.95	£9.95	_	Yes	Yes	-	-
4	Early Learning	BBC Soft	£10	~_	7		Yes	-	
5	German Master	Kosmos	€.8.95	€,9.95		£8.95	Yes	-	. —

Compiled by Gallup/Microscope. *Contact publishers: BBC Soft, 35 Marylebone High Street, London W1M 4AA. Tel: 01-580 5577. Kosmos Software, 1 Pilgrims Close, Harlington, Dunstable, Beds. Tel: (05255) 3942. ASK, London House, 68 Upper Richmond Road, London SW15. Tel: 01-874 6046. Longman, Burnt Mill, Harlow CM20 2 JE. Tel: (0279) 26721.

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NEWS

Highlight in the spotlight

Highlight Software is the featured company in our small software houses section this month. It produces a wide range of primary materials which are programmed to a very high standard – in terms of maths, road skills and reading and language development these deceptively simple programs are some of the best I've seen.

Most are aimed at the seven to



Entertaining English: good 'taster'

11 age range. The principle is that the ideas should be presented in a stimulating and visually attractive way. For this reason nearly all the programs are 'arcade' in style.

Also, the programs have more than one level of difficulty, designed to allow children to develop their skills in a practical fashion. For example, in the Adventurous English package which deals with positional adverbs, the simple exercise used in the first part of the program is turned into an adventure game-cum-logic puzzle in the second. The Read Right Away series takes novel approaches to vocabulary and spelling and reinforces principles behind these skills without the child even noticing! I recommend Read Right Away Pack 4 or Entertaining English as a taster.

Details from 36 Sherbourne Close, Barry, South Glamorgan CF6 5AQ. Tel: (0446) 745482.

Wordprocessing made easy

Three primary wordprocessing packages have just been launched which each copes with the problems of introducing children to the basic concepts of editing and text handling in a totally different way.

WordPlay from BBC Soft uses animation to make the available facilities attractive to users. For example, when right-justifying the text Eve the Elephant marches up from her place at the bottom of the screen and tugs the padded text into position. Other characters left-justify, control deleting, move and copy text, push lines up and down or implement the filing utilities. The whole package comes complete with a spelling checker and dictionary editor. WordPlay is available for BBC B and Electron on cassette, transfer-

Probably the most sophisticat-

ed package of the three is *Pendown* from Logotron, which uses both chip and disc to give a wide variety of facilities.

Pendown incorporates not only a spelling checker and dictionary but also a 'tree'-based planner enabling the child to consider the title of the piece being written, the separate paragraph headings, elements within those paragraphs, sub-elements of those elements and so on to a depth of 10 levels. The whole plan may then be transferred into the wordprocessor with indentations marking the level being worked at.

On-line help

While the child is engaged in text creation there is on-line help with both vocabulary and spelling from the dictionary and its accompanying thesaurus facility.

Delete is effective in two modes

– auto-repeat or single character.

In single character mode the character above the cursor is deleted.

Print out of the final product is always important. The *Pendown* package allows a variety of fonts to be defined and comes complete with a Jumbo font which produces double-height, double-width characters.

Another wordprocessor has developed that facility further. Folio from Tedimen Software is a beautifully presented package which allows three different sizes of text to be printed. There is no attempt to provide a huge variety of facili-

ਜੈ ਘਰਿ ਕੀਰਤਿ ਆਖੀਐ ਕਰਤੇ ਕਾ ਹੋਇ ਬੀਚਾਰੇ ॥ ਤਿਤੁ ਘਰਿ ਗਾਵਹੁ ਸੋਹਿਲਾ ਸਿਵਰਿਹੁ ਸਿਰਜਨਹਾਰੇ ॥੧॥ ਤੁਮ ਗਾਵਹੁ ਮੇਰੇ ਨਿਰਭਉ ਕਾ ਸੋਹਿਲਾ ॥ ਹਉਵਾਰੀ ਜਿਤੁ ਸੋਹਿਲੇ ਸਦਾ ਸੁਖੁ ਹੋਇ ॥੧॥ ਰਹਾਉ ॥ਨਿਤ ਨਿਤ ਜੀਅੜੇ ਸਮਾ੍ਰ

Tedimen's Punjabi wordprocessor

Database to order

The entire database of educational software compiled by Nick Evans and featured in part on pages 159 to 170 is available from *Acorn User* in a variety of formats at £5.75. The datafile contains over 1700 records and is available for the *View Store* database. It may also be obtained as a text file for the *View*

wordprocessor which can be converted into a datafile for a number of other database packages with a utility for 'grabbing' records.

The disc comes complete with the address list of publishers and instructions as to the most appropriate methods for searching the package with *ViewStore*.

ties – instead it's an extremely friendly introduction for even the youngest child. In common with Pendown, this package may be connected to the Concept Keyboard. There is clear indication of where one line merges into another, thus providing a visual clue to the continuity of text across page lines. File handling is simplicity itself and the whole package is designed to avoid the simple errors that little fingers can make.

Tedimen also produces foreign language word-processors and has Indian dialect packages which cover Hindi, Gujerati and Punjabi – Urdu and Arabic scripts will follow shortly.

Contact Tedimen Software, PO Box 23, Southampton SO9 7BD. Tel: (0703) 473774. Logotron, 59 Markham Street, London SW3 4ND. Tel: 01-352 1088. BBC Soft, 35 Marylebone High Street, London W1M 4AA. Tel: 01-580 5577.

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FIRST TRACK YOUR SATELLITE...

Do you want to keep your eye on the 'eyes-in-the-sky'?
Then why not use your micro to keep track of them?

Craig Underwood and Eric Twose

A few keen amateurs have been involved in the tracking and receiving of data transmitted from satellites for many years, notably using the TIROS series of meteorological satellites. Recently the field has expanded to include satellites involved in scientific experiments and radio-amateur work which can be categorised as: polar orbiting weather satellites — the NOAA and the METEOR series; geostationary weather satellites — METEOSAT; scientific/radio-amateur satellites — the UoSAT series; and radio-amateur satellites — OSCAR and the RS series.

Each category has its own merits. For example, the NOAA, UoSAT and OSCAR spacecraft have the advantage of being fairly inexpensive to track in terms of ground-station facilities; however, they are only within range of the UK for relatively short periods each day. The geostationary METEOSAT is more expensive to receive because of its ultra high frequency (1.6945GHz) radio transmissions, but it has the advantages of producing very high quality pictures and of being available all the time.

Getting started

You don't need to be a technical wizard or have masses of expensive equipment to get started. All that is required for a basic satellite tracking-station is a radio-receiver tuned to one of the satellites, a suitable aerial (possibly home made), a tape recorder to record any transmissions received and a micro.

The particular equipment you use will partly depend upon the satellite you wish to track. We cannot go into great detail here, but have provided a list of some suitable equipment and further reading at the end of this article.

To save listening to 'white noise' for hours, you'll need some way of predicting when a satellite is within radio-range, and although this can be done manually, the micro will give you a fast and accurate fix on the satellite's position as well as providing a means of decoding and displaying received data.

Apart from the special case of a satellite in a geostationary (geosynchronous) orbit, all satellites appear to 'rise', move across the sky and 'set'. Thus they will not always be in the sky or within your radio-range.

If a satellite orbits the Earth at a height of approximately 36,000km its orbital period

equals 24 hours. If such a satellite is in orbit over the equator, it always appears to hang over a fixed point on the Earth's surface. This is very useful for communications satellites and some weather satellites as they can give continual radio or photographic coverage of almost a third of the Earth's surface.

To receive signals from a geostationary satellite, such as METEOSAT, all you do is point the aerial at the part of the sky where the satellite appears to hang.

Another important class of orbits is the polar one (as used by UoSAT, NOAA and most Earth imaging satellites such as LANDSAT). Here, the satellite is launched so its orbital path takes it close to the poles on every orbit; hence the name. The advantage of this is that as the Earth rotates under the satellite, virtually the whole surface of the Earth comes into view. This is particularly useful for Earth-imaging satellites which can

by using tables, published by AMSAT-UK (see the references panel at the end of this article, page 151).

AMSAT-UK's 'OSCAR-locator' uses the information within these tables and provides a low-cost method of predicting the orbit of a satellite. The OSCAR-locator is a circular cardboard map representing a view of the Earth from above the north pole.

A movable 'D-shape' represents the generalised path of a polar-orbiting spacecraft over the northern hemisphere. This is free to move about the centre of the map, so it can be set up as indicated by the data in the tables to predict whether the satellite will come into range of the UK on that orbit and, if it does, at what time.

Complex orbits

The OSCAR-locator is just one method of keeping track of satellites. For more complex

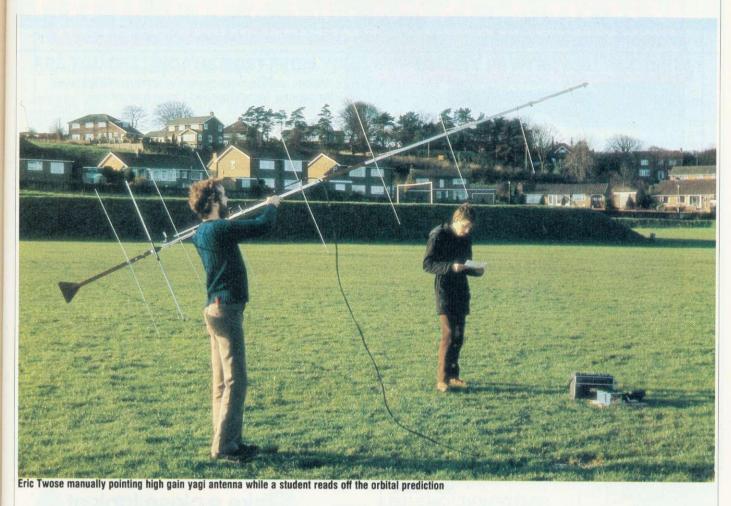


Antenna control station: BBC micro and control box

thus photograph the entire globe. These polarorbiting satellites will pass within range of a ground-station in the UK four to six times per day. These passes occur in two groups, separated by approximately 12 hours. In one group of passes, the satellite will appear to be 'ascending', ie, travelling from the equator, towards the north. In the second group, (half an Earth revolution later) the satellite will appear to be 'descending', ie, travelling from the north towards the equator. These times can be found orbits, like that of OSCAR-10 (which is a very eccentric ellipse), there are some excellent computer programs available. AMSAT-UK can advise on suitable software.

Getting a computer to perform the same task as the OSCAR-locator is fairly straightforward, but a full blown orbital prediction package requires a lot of 3D co-ordinate geometry and a knowledge of the effects of atmospheric drag.

Tracking any of these satellites will require



some form of antenna but a 'long-length-ofwire' will only give a good signal with the Soviet RS (Radio Sputnik) satellites, which transmit on the comparatively 'low' radiofrequencies of 29-30MHz. All the other spacecraft mentioned transmit at much higher frequencies and other kinds of antenna are more effective. Each category of satellite requires its own antenna, whose shape and dimensions are determined by the frequency and polarity of the radio signals transmitted. Signals from the UoSAT-1, UoSAT-2 and OSCAR-10 spacecraft can be received using an antenna designed for 144-146MHz operation (the 2m band), while the NOAA series need one that works in the 136-138MHz band.

Unfortunately, METEOSAT transmits on a very different frequency – 1694.5MHz – for which it is difficult to make a conventional antenna with sufficient gain, so METEOSAT is usually received via a dish antenna. Such systems are available commercially and often have a 'down-converter' so they can be plugged into a NOAA-type, 137MHz receiver. However, these systems tend to be expensive.

The simple dipole is a basic radio-wave detector. In practice, the dipole is made out of two quarter-wave lengths of tubular aluminium mounted end-to-end with a slight physical separation and insulated from one

another by the plastic mounting. The external screening braid of the co-ax(ial) antenna downlead is connected to the end of one element, while the inner signal core is connected to the other.

You could easily make such an antenna yourself. Or perhaps someone has an old VHF antenna tucked away which can be dismantled and cut to suitable dimensions.

Increasing the gain

The dipole has a low gain which means that only strong signals are detected, but it has the advantage of being omni-directional so it may be permanently mounted. To increase the gain, more 'parasitic' elements can be added. Unlike the active dipole, these are made from single lengths of narrower gauge aluminium and do not need insulating from the tubular aluminium antenna boom. The more elements, the higher the gain and the more directional the antenna, so high-gain antennae need to be steered so they actually point at the satellite as it passes.

In many ways, at VHF and UHF, the helix is an ideal aerial for satellite tracking as it's circularly polarised and easy to build (a plastic drain-pipe, some dowelling and a length of wire is all that's needed – it works very well!). The more turns, the more directional and the

higher the gain; the fewer the turns, the less gain, but the less accurate you have to be in pointing the antenna. For example, with about two turns, the antenna can be permanently mounted pointing up and it will then pick up most passes.

Another bonus of the helical design is that an antenna tuned into UoSAT will also work well with NOAA, provided you can easily rewind the helix the other way. This is because the radio signals transmitted by both spacecraft come down a bit like a corkscrew and whereas NOAA is a right-handed 'screw', UoSAT is left-handed.

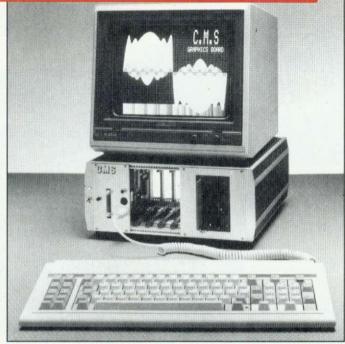
Dish antennae are only of use with the UHF transmissions of the geostationary METEOSAT. You could make a one- or two-metre dish from glass fibre and chicken wire/kitchen foil.

You can pick-up UoSATs 1 and 2 using a hand-held 144-146MHz narrow band FM 'walkie talkie' receiver (costing under £50) and by having a simple whip antenna.

Such a receiver allows you to listen to the 'Dalek-like' digitalker on board the UoSATs. This is a computer-synthesised voice which 'speaks' a series of numbers representing the status of the systems on board the spacecraft. However, if you are interested in actually recording the digitalker's spoken telemetry or

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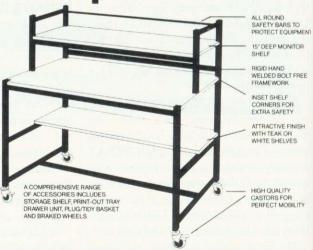
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SYSTEM DELTA

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- index names, and many more.

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(makes other databases for the BBC micro look silly by comparison.) MICRONET800 dec 85

For the first time, data handling programs can easily be written using simple commands. Now your application can be tailored to look as you wish, and do what you want, without any knowledge of how the data is stored. System Delta also contains screen presentation, menu selection etc. e.g. one command to scroll around card.

Supplied with CARD INDEX APPLICATION for non-programmers, which uses most System Delta facilities. Other System Delta applications available early 1986 include Stock Management, Accounts and Estate Agents etc.

5 files open at once, 8 subsets, 8000 cards per file, 255 fields per card, 200 characters per field. FULLY RELATIONAL e.g. copy customer/product details onto an invoice from different files.



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Card Index Application (Includes card index support, System Delta ROM)

System Delta Advanced Reference 19.95 (Includes System Delta support)

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the two satellites' digital tone-encoded telemetry, you should check that the receiver has an audio output/headphone/extension speaker socket, so you can take an output to a cassette recorder or portable reel-to-reel machine.

A simple receiver-antenna system such as this will get you started and will be sufficiently sensitive to allow you to collect data. Some days during the week one pass will be close enough to allow reception of a good deal of data on that pass and some data on the earlier and later pass; on other days, two passes will fall either side of your tracking station, so you'll be able to get a fair amount of data from these two passes.

However, if you want to pick-up more data, more reliably, you'd be advised to get a better receiver. Around £60 will buy you a 2m narrow band FM receiver that looks like the sort of CB rig mounted under the dashboard of cars. The only thing about these receivers is that they'll only allow you to pick up UoSATs 1 and 2.

The NOAA series transmit at VHF on the 136MHz band – see 'Downloading the Weather', *Acorn User* August 1984, for more details.

If you are prepared to pay a price of between, say, £150 and £700, there are receivers and transceivers (transmitter plus receiver)



View of antennae: yagi left, NOAA right, and simple dipole

Scarborough Sixth Form College and got involved with satellites in January 1984, when we received a booklet from the University of Surrey about UoSAT-1. To start with, we bought a receiver for about £50 and made up a crossed-dipole aerial out of wood and weldingrods, which was connected to the receiver by a length of standard TV co-ax. With this basic

from digitalker wasn't very satisfactory, as it took a few minutes for the telemetry to be 'spoken'. During this time, there were many bursts of noise which made it difficult to understand the electronic speech.

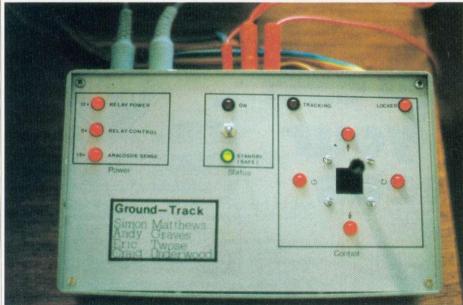
On the other hand, the digital telemetry was transmitted continuously, each 'frame' of data lasting five seconds. This would provide far more data per pass, and be more error-resilient, but it needed some additional hardware before the signals could be decoded. Thus, shortly after picking up the first few signals, we began to write an orbital prediction and a telemetry data handling package. These were to become *Sat-Pack*.

Perfect reception

Meanwhile, UoSAT-2 was launched and as its signals were directly compatible with the BBC micro, we concentrated on this spacecraft. We were also lucky enough to be loaned a cross-polarised yagi aerial by the Physics Department of the University of York. Although bulky, this enabled us to pick up the satellite's signals close to the horizon and achieve pass times in excess of 15 minutes with mostly perfect reception of data.

It soon became clear that if we were going to stick with a high gain antenna, some form of remotely-controlled system was required to track the spacecraft. To this end, an ex-outside broadcast camera mount was bought for £45.

After about a year's project work, we've managed to get this system under the complete, real-time control of a pair of BBC micros. One runs the *Sat-Pack* orbital prediction package which outputs tracking data via the RS423 port, while the other runs our control program, taking this data in and tracking the aerial automatically.



Antenna control box allows manual control via the joystick

on the market which will allow you to cover most of the current satellites.

A number of manufacturers are now producing 'complete systems', ie, aerials, receivers and decoders, for some of the satellites mentioned. These might well represent a good entry point into satellite tracking — as always, though, it pays to shop around.

A practical set-up

The Ground-Track Project was set up at

system, UoSAT-1's telemetry and digitalker was picked-up for the first time on February 29 1984. A quick program was then written to produce experimental results from the numbers which were keyed into a BBC micro while listening to digitalker.

It was quickly realised that the path of the satellite had to be predictable, as up until that time, the receiver had to be left on all the time, as we had no idea when the satellite was within range. It was also found that getting results

Recently, work has restarted on UoSAT-1. We are testing the prototype of a system called Astrid (produced by MM Microwave Ltd), which consists of a simple dipole aerial, connected to a receiver/decoder which has the ability to control a cassette recorder. The onboard decoder produces TTL signals from both UoSATs and plugs into any RS232-compatible port. On our system, it is linked to the RS423 port on the BBC micro, which is running the *Sat-Pack* telemetry handling/graphing packages.

We are also beginning to investigate the use of satellite weather pictures received from NOAA. We have a Cirkit weather receiver (about £50) connected to a turnstile aerial (from Halbar).

This is mounted on the roof, pointing up. It is found that the signals are only strong for a couple of minutes on a good pass, so we really need a pre-amp, or a steerable, high-gain aerial. The pictures are recorded on the BBC micro via the Unilab interface.

The Sat-Pack package currently comprises three discs. Orbital Prediction is a very powerful suite of programs designed to locate the position of any satellite (including those of high orbital eccentricity) and to plot its ground-track so the user knows exactly when a satellite is within range of their receiver. Information can be displayed in a variety of forms including tabular 'Whole Earth' Mercator Projection, Northern Hemisphere Polar Projection and European Theatre Projection. Data is also sent to the RS423 serial port or disc file to allow control of a tracking aerial.

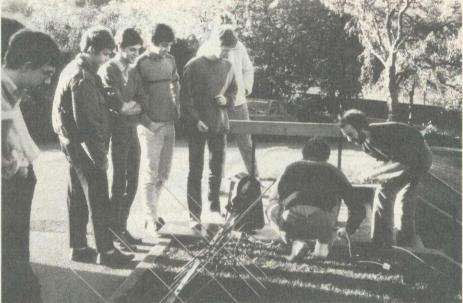
UoS AT-2 Telemetry is a suite of sophisticated data handling programs, specifically written to decode the telemetry transmitted by the University of Surrey's satellite, UoSAT-2. This

data can be picked up as a 1200 baud Audio Frequency Shift Keying (AFSK) signal, very similar to the signals which encode BBC micro programs onto cassette tape. By feeding these signals into the cassette or RS423 port of the Beeb from a tape recording or in real-time, they can be translated into numerical data which are analysed for errors and stored on floppy disc as a 'processed data file'. This can then be displayed in a variety of ways. The

'industry standard' among radio-amateurs. It's available through AMSAT-UK and directly benefits the Space Programme.

Conclusion

We started satellite tracking for an initial cost of about £50. Our present system, excluding computers, is worth about £360. This includes an aerial and receiver for NOAA, a high gain aerial, rotator and receiver for UoSAT-1 and 2,



Getting ready for pictures: students fit the yagi antenna on the camera mount

processed data file has a simple format so the user can write his or her own data handling routines to complement the package.

Graphics Disc is a suite of programs allowing the user to graph the telemetry data generated by the second disc, and to look for data correlations.

Sat-Pack is already in use in many schools and colleges and is rapidly becoming the

Astrid for the UoSATs plus the complete Sat-Pack software (three discs). That is, for less than the cost of a BBC micro, we can track most of the satellites generally available, providing work in computing, electronics, control technology, physics and geography.

You don't have to be a technical wizard to get started and satellite tracking is not only educational but also great fun!

REFERENCES

Useful books

The Satellite Experimenter's Handbook, Martin Davidoff, ARRL

The Sheffield Project, S J Spencer VHF/UHF Manual, RSGB

ARRL Radio Amateurs' Handbook, ARRL Oscar News, AMSAT-UK

Bi-monthly journal with Orbital Calendar. Free to members, but the calendar is available to non-members for a small fee.

All these publications are available from AMSAT-UK, which is a totally voluntary radio amateur's satellite organisation and user group.

Contact Ron Broadbent, G3AAJ, Hon Secretary, AMSAT-UK, 94 Herongate Road, Wanstead Park, London E12 5EQ. Please enclose an SAE.

Aerial suppliers

Halbar Ltd, Unit 1, Bury Walk, Bedford MK140DU. Tel: Chris Meadows on (0234) 44720.

UoSAT, NOAA turnstile aerials, etc, plus a complete weather satellite system.

Randam Electronics, 12 Conduit Road, Abingdon OX14 1DB. Tel: (0235) 23080. Multi-element yagis, etc.

Jaybeam Ltd, Kettering Road North, Northampton NN3 1EZ. Tel: (0604) 46611.

Antennae and accessories.

Receivers

MM Microwave Ltd, Unit 1, Thornton Road Industrial Estate, Pickering, N Yorks YO18 7HZ. Tel: Steve Webb or Ken Maddock on (0751) 74713. Can supply Astrid, a complete system for UoSAT.

Cirkit Distribution (formerly Ambit), Park Lane, Broxbourne, Herts EN10 7NQ. Tel: (0992) 444111.

Can supply receivers, pre-amps, converters, books, etc.

Timestep Electronics Ltd, Wickhambrook, Newmarket, Suffolk CB8 8QA. Tel: (0440) 820040.

Can supply a complete system for UoSAT or NOAA.

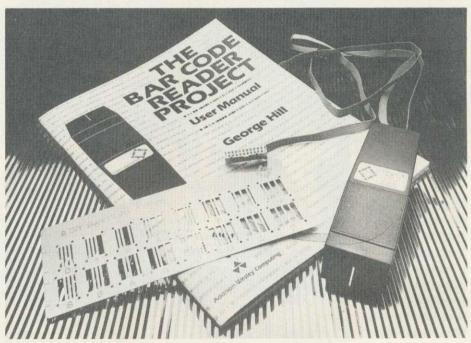
Software and hardware

Sat-Pack and other satellite software is available from AMSAT-UK, together with hardware decoders, PCBs, etc. Contact: 94 Herongate Road, Wanstead Park, London E12 5EQ. Please enclose an sae.

BARCODE

ACORN USER OFFER

Bar code readers and program booklets



Illustrated above are some of the contents of the Bar Code Teaching Pack, designed to give the student or home user the chance to learn about and use bar code technology.

The pack was developed by the Microelectronics Education Programme (MEP) and Addison-Wesley and is available direct to readers of *Acorn User*.

The pack includes:

- the bar code reader which connects directly to your microcomputer
- a user manual written by George Hill
- software to print bar codes and a metal bar code stencil
- a 40-track disc or cassette of utility software – the cassette software can be transferred to 40 or 80 track disc.

The total pack costs £83.84 inc VAT and £2.95 postage (£72.90 exc VAT), and the Department of Trade and Industry (DTI) has accepted the teaching pack is eligible for support in its entirety.

Bar code booklets

All the major listings for this issue, as printed on the yellow pages, are reproduced in bar code format in our booklet. Send a cheque or postal order for £1.90 plus an A4-sized sae to the address below.

Back issues of the booklets are available from December 1984 onwards, so you can catch up on any you missed.

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VISION OF THE FUTURE

We explore the subject of computer awareness and look at the need to teach children the facts of computer life

Chris Drage and Nick Evans

'Why "computer awareness"? What's so special about the computer that we need to be made aware of it?' These questions are often thrown at computer enthusiasts who try to persuade their colleagues, especially in school, to realise the role that the computer can play in their work. In rather stilted terms we can mention 'pen awareness' and 'chisel awareness' especially if we talk about them as tools for performing certain tasks. 'chalk awareness' and 'overhead projector awareness' are ones that should be within every teacher's experience. The computer as a tool, for children and adults, inside school and out, is becoming of vital importance. This is reflected in the growing numbers of packages designed for teaching children the facts of computer life and bringing. their teachers' methods more up-to-date.

Short-term problem

The problem with computer awareness is that it should be a short term problem. Even with the rise of the computer in every aspect of our lives many people are still unaware of its possibilities. They need training. Children too, especially in the upper parts of the junior and throughout the secondary school, do not have any depth of knowledge about the computer unless they have been trained. However, if you take the average eight or nine-year-old in the class of a 'computerate' teacher and ask them to use a program, awareness of the way things work, the setting up of the machine, the layout of the keyboard and a general familiarity and air of unconcern becomes immediately noticeable. This child is already 'computer-aware'. He or she will not need a computer awareness course as it is at the moment - computer studies, perhaps - the computer already is a normal part of everyday life.

Every time the school computer is used it builds on teacher's and pupil's awareness of the micro's capabilities and shortcomings. Both children and teachers need to understand what micros are, what they can do and how they do it. This is an area vital to the primary school, where, for a variety of reasons, many teachers are still very unaware of the power of the micro in aiding learning. Any way the technology can be de-mystified, made 'more friendly' and can be seen to further children's learning in the classroom must be welcome.

For very young children the concepts related to understanding the role of microcomputers are too complex. It's unnecessary to formalise their computer understanding beyond actually sitting them down and letting them interact with good software which relates to their everyday experiences. By the middle or top of the junior school, however, the situation is different. When presented in the right way, children do begin to understand the concepts involved, and it's at this level where two very successful resources come into their own: Using your Computer from BBCSoft/BBC School Ra-



Using your Computer first appeared two years ago

dio and *The Micro at Work* from Granada TV/GSN. Adopting two differing approaches, both these packages are extremely valuable in the primary school.

Using your Computer first appeared two years ago when it was broadcast as Introducing Science Extra. Its Computer Synchronised Audio



'BBCSoft's approach is an instant success'

(CSA) approach is the brainchild of Arthur Vials and Fred Harris (of *Micro Live* fame). It's a technique which combines an audio voice-track with software to provide a unique audio-visual presentation (see Education News in the February '86 issue of *AU*). This approach is an instant success in the primary classroom.

BBCsoft now presents the broadcast and software tapes with a comprehensive manual which contains the scripts for each of the four topics, including In the Picture; Does it Think?; Basically Speaking; and Bags of Chips.

I decided that this package would be an excellent opportunity to help a computer-shy teacher and her 10-year-old pupils get to grips with the school's BBC micro. The teacher concerned worked through each of the CSA presentations herself before involving the children, which proved very valuable as she learnt

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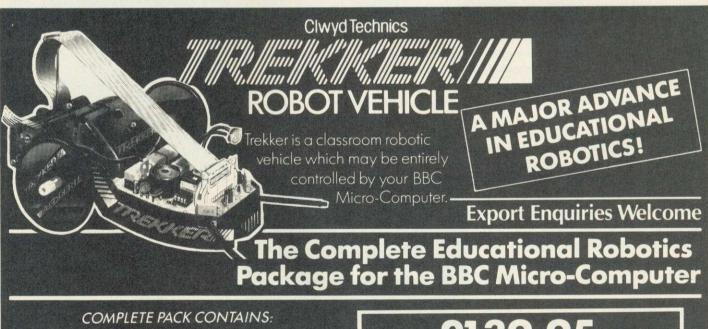
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'so much about computers' it gave her confidence to introduce the micro into her teaching. With the children in groups of four, she set up a cassette recorder with a junction box and four headphones attached, which enabled the group to work silently without distracting the rest of the class (I had previously turned off the Beeb's sound output by *FX210,1). When every group had completed the first presentation they began the next. It proved a very stimulating and rewarding experience for all concerned. My only criticisms of an otherwise excellent package are the desperate need for a tape-to-disc copier routine to handle transfer to disc storage, and a way of silencing the sound output from the computer.

Computers at Work, also by BBCSoft, will provide a valuable follow-up for this class.

/ed ted as a 'visit' to a particular location where computers are at work. They illustrate how computers provide solutions to particular human problems, emphasising the interaction of humans with computers and the benefits of computerisation. Each programme illustrates how scaled-down versions of featured applications can be handled in the classroom. Although they will have been broadcast by now, a compilation video will be available from Granada – alternatively your local teacher's centre may have recorded the broadcasts.

As each topic is independent of the others, the broadcasts can be regarded as starting points from which a number of activities can evolve – the series booklet provides a wealth of suggestions for developing the topics and providing follow-up activities.

Tovide a valuable follow-up for this class. | providing follow-up activities.

'Computers at Work also uses CSA and is a valuable follow-up to Using you Computer'

Using the same CSA format, it is also aimed at nine- to 12-year-olds. It looks specifically at two of the most important and exciting applications of computers: robots and information technology (wordprocessors and databases). Children familiar with the former pack will undoubtedly look forward to the latter.

How computers are used

Granada TV has put together a particularly exciting package of TV broadcasts and computer software called *The Micro at Work* which is aimed at the top end of the primary (lower secondary) school. A series of 10, 15-minute broadcasts serves as resource material for teachers wishing to introduce aspects of computer usage into the curriculum. Unlike the BBCSoft packages, the stress is on how computers are used, not how they work or are programmed. The broadcasts can be regarded

Three packs of software are available separately. The first and third packs provide excellent simulations: Travel Agent is particularly useful as the whole class can be involved in planning and describing their 'holidays', and Design A House is an impressive and outstanding piece of software which one would not expect to find as part of a series. The two disc pack comprises all the materials needed to design a house, plan and modify its furnishings and print out the designs, and, like Travel Agent, large numbers of children are catered for. Most of the children work away from the computer while each group tests its design for added reality, each group has its own budget in which to work.

I found the second pack lacked the sophistication of the others, adopting an 'electronic blackboard' approach.

The flexibility of this series of programmes

is excellent. With the exception of programme eight (the delivery of which I found rather weak), the broadcasts provide a real starting point from which all manner of activities can stem. There is considerable freedom to organise these activities in any way a teacher finds suitable, with or without the computer.

Both BBC and Granada TV provide more than adequate computer awareness materials for the children – but what about the teaching staff? Until all teachers understand the possibilities offered by computers to enhance children's experiences and are willing to have a go themselves, educational computing will only occur in patches throughout the school.

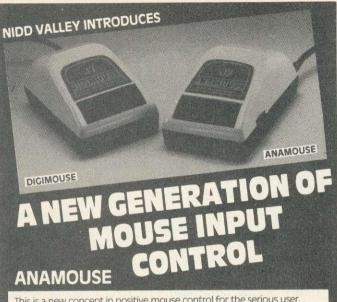
Impressive titles

It is with the development of computer awareness through in-service training that Resource (Humberside and South Yorkshire MEP) has produced its ISIS pack. The In-School-In-Service package provides 11 items of software, a modified NESTEC buggy (with interface board), complementary teacher materials relating to each pack and a case study of computer use in industry with 15 accompanying slides. The software titles are impressive enough: some are 'vintage' pieces; others newly designed especially for the pack. Yet what makes the ISIS pack so special is that it comes complete with a delivery system to enable each school to create a structure in which the materials can be used across the curriculum - a system whereby the staff can communicate their computer experiences to their colleagues through school-based INSET courses. For teachers using the school computer for the first time there are considerable support materials to guide them through a series of lessons and help with learning is provided by school-based in-service courses.

There isn't space here to do the ISIS pack justice. Resource was voted the Educational Software House of 1985 by Educational Computing and the ISIS pack only confirms this choice. If you have teachers in your school who say: 'I don't understand computers' or 'I don't have the time to learn about it' or, 'I cannot entrust the children's learning experiences to a fallible machine', the ISIS pack will go a very long way in helping them undergo a change in attitude. It provides a crutch, a stimulus and a starting point in a large range of school computer applications.

Also from Resource comes the *IT in the Secondary School* pack which provides materials and case studies for introducing secondary school pupils to the ideas of how a computer is linked to a variety of real life applications.

This emphasis on the computer in business is taken up by many other packs, all vying for



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schools' attention. Computers, Information and You from Acorn/CES follows a thematic approach to the subject in which the businesses in a small town are faced with the problems of integrating the new technology into their work. Data handling, design, spreadsheets and problem-solving are tackled in a thorough fashion. Also from Acorn/CES is The Information Age, which deals with the implications for the home and studies banking, communications and wordprocessing.

Excellent package

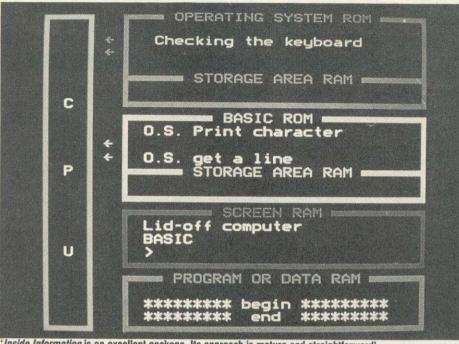
BBC Publications has a more advanced guide to computer use called Inside Information -Computers, Communications and People. This package is excellent for a variety of reasons. First, it has appeal at a number of levels. For teachers, as an introduction to computer use in industry it can perform a similar task to the ISIS pack on the use of computers in the classroom. Its approach is mature and straightforward. As far as possible it tries to deal with jargon in a sensible way, explaining as it goes and, because of its approach through a variety of media, if its message doesn't get through in one way, it will in another.

The pack contains a substantial colour paperback book, two audio tapes and a pack of software which deals with control, wordprocessing, computer operation and data handling. So complete is this package that the City and Guilds of London Institute has built a course on Information Technology around it.

As explained earlier, computer awareness in education divides into two main areas - pupil awareness of their world and teacher awareness of the possibilities for computer use. This last is likely to be of great importance soon, as the Microelectronics Support Unit swings into action with development of teacher support materials for existing software as one of the main aims in its brief.

Despite the widespread availability of both computers and software (see page 159 for a software database which represents only some of the education material currently available) many teachers have not yet ventured into the realm of computer use. Many are intimidated, others apathetic, some frightened. Being naturally resistant to change, many teachers have not taken to the micro in the way one might hope. Moreover, many staff had bad early experiences - programs wouldn't load and when they did they often crashed.

Getting over this antipathy is a problem, not least because of all the recent disruption in education. Nonetheless a number of initiatives are forcing teachers to sit up and take notice, not least among them TVEI (Technical Vocational Education Initiative) which has present-



'Inside Information is an excellent package. Its approach is mature and straightforward'

ed schools involved in the scheme with vast sums of money to spend on integrating technology into the syllabus. The first step in any such enterprise must be teacher education and many of the above packages will work for teacher home-study and in the classroom.

Children's needs are different. The study of computer use is attractive if it's aimed at the right pupils at the right time. Inside Information, for example, would be totally inappropriate at the lower end of the secondary school since it is aimed at the Further Education market. However, studies of computer applications which have links into other curriculum areas expand usefulness to the teachers and get away from the idea that the computer is for use only in the computer room. Take, for example, a component part of the ISIS pack - the Lettuce Factory Case Study. This item was devised by Stan Spencer, Advisory Teacher in Computer Education in Sheffield, for use in the lower secondary school. It looks at the effects that computerisation had on a market garden specialising in year-round lettuce production. Not only is the use of the computer important in this package, but also an understanding of the things which the computer is controlling the biological processes, the environment in the glasshouses, the problems of weather and so on. All of these have links into other areas meaning that a cross-curricular approach can

Computer awareness must be relevant to both pupils and staff. It must serve to enhance education. It should build a realisation that computers are used in a much broader context than that demonstrated in many schools' computer laboratories. If some of the packages

mentioned above achieve only a part of this, they will have been well worth the money.

PROGRAM DETAILS

Computers at Work BBC B, cassette,

BBCSoft, 35 Marylebone High Street, London W1M 4AA. Tel: 01-580 5577

Using your Computer BBCB, disc (Econet compatible), £29.95

BBCSoft, as above

The Micro at Work Pack 1 BBC B, cassette or disc, £12.42

Mercury Music, Dept MW, PO Box 194, Sevenoaks, Kent TN158TZ

The Micro at Work Pack 2 BBC B, cassette or disc, £12.42

Mercury Music, as above

The Micro at Work Pack 3 BBC B, disc £17.95

Mercury Music, as above

ISIS BBCB, disc, £130

Resource, Exeter Road, off Coventry Grove, Doncaster DN2 4PY. Tel: (0302) 63800

Inside Information

BBCB cassette (transferable to disc), £28.85 BBCSoft, as above

IT in the Secondary School BBC, disc, £19.95

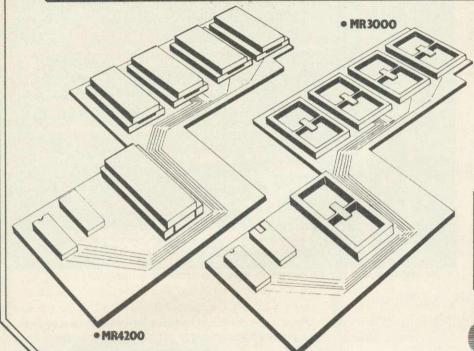
Resource, as above

Computers, Information and You BBC,

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The Information Age BBC, disc, £34.50 Acorn/CES, as above

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The selection of records printed on the following pages is taken from the educational software database compiled by Nick Evans for *Acorn User*. The records have been chosen from a variety of subject areas to give an idea of the content of the database. The full range of subject areas covered in the whole package is as follows (the letters in brackets are the key):

- (a) Arithmetic
- (b) Biology
- (c) Chemistry
- (d) Economics/Business Studies
- (e) English
- (f) Road Skills
- (g) Geography/Geology
- (h) History
- (i) Computer Studies/Control
- (i) Engineering/Technology
- (k) Music
- (l) Languages
- (m) Mathematics
- (n) Number Bonding

- (o) Logo
- (p) Physics
- (q) Quiz, Test or Problem Solving
- (r) Rote
- (s) Simulation/Adventure
- (t) Typing
- (u) Statistics
- (v) Reading and Spelling
- (w) Writing
- (x) Recognition and orientation
- (v) Library
- (z) Astronomy
- (aa) Wordprocessing
- (bb) Design

- (cc) Analysis/Classification
- (dd) Database
- (ee) Topic Based
- (ff) Food and Nutrition
- (gg) Graphics and Art
- (hh) Assessment
- (ii) Ecology
- (jj) Authoring
- (kk) Careers
- (II) Computers in Schools
- (mm)Management
- (nn) Sociology and Psychology
- (00) Religious Education

No responsibility is taken for inaccuracy in the listing. As far as possible prices and packages referred to have been checked from latest catalogues where these have been made available. Prices may vary with respect to whether they have been quoted including VAT or not. The machine classification does not exclude the programs from use on later models – it is merely that the publisher does not necessarily state explicitly that his software runs on anything other than BBC micro. See page 145 for an order form.

4mation, Linden Lea, Rock Park, Barnstaple EX32 9AQ. Tel: (0271) 45566

Abacus, 21 Union Street, Ramsbottom, Lancs

ABC Primary Software, 19 Crumstone Court, Killingworth, Tyne and Wear. Tel: 091-268 2627

Acornsoft, Technopark, 645 Newmarket Road, Cambridge CB5 8PD. Tel: (0223) 214411

Addison Wesley, Finchampstead Road, Wokingham, Berks RG11 2NZ. Tel: (0734)

AJ Software, 61 Jeddo Road, London W12 9ED

Ajax, 57 Rowley Street, Walsall WS1 2AZ Akadamias, UCNW, Bangor LL57 2DG. Tel: 351151 x354

Alan Wiltshire, 12 Barrow Road, Lowestoft NR32 3PN

Alpha Computer School, 33 Chesswood Road, Worthing BN11 2AA. Tel: (0903) 210701

Ampalsoft, 31 Woodbridge Road, Blackwater, Camberley, Surrey. Tel: (0252) 876677

AMS Advanced Memory Systems, 166-170 Wilderspool Causeway, Warrington WA4 6OA. Tel: (0925) 413501

Argus Press, 1 Golden Square, London W1R 3AB. Tel: 01-437 0626

Arnold Wheaton, Parkside Lane, Dewsbury LS5TD

ASK, 32 Bridge Street, Cambridge CB2 1UJ. Tel: (0223) 65445

ATM, Kings Chambers, Queen Street, Derby DE1 3DA

AUCBE, Endymion Road, Hatfield, Herts. Tel: (07072) 65443

AVC, PO Box 415, Harborne, Birmingham B17 0HD

BBC Publications, 35 Marylebone High Street, London W1M 4AA. Tel: 01-580 5577 x 4128

BeeBinEd, The Coach House,

Hunsdonbury, Ware SG12 8PW. Tel: (0920) 870508

Beebugsoft, PO Box 50, St Albans, Herts. Tel: (0727) 40303

Beltech, College House, St Leonards Close, Bridgnorth, Salop BES, Bourne House, The Hundred,

Romsey SO5 8BY. Tel: (0794) 523301

Betasoft, 5a St Stephens Road, Cold Norton, Chelmsford CM3 6JE

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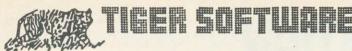
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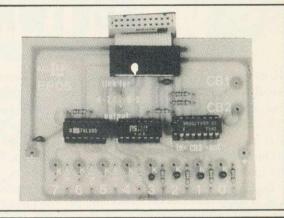
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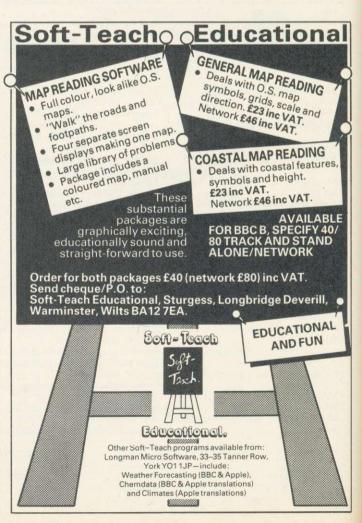
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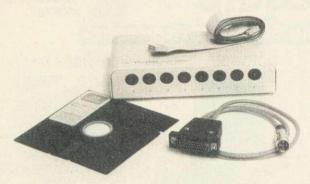
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Human Biology 1 & 2 Human Energy	Garland Longman	£31.75 £20.13	B,B+,Electron B,Econet	Sec	b	Introducing Science Minerals	Earth Science	£7 £13.95	В	Sec	c,g
Inheritance	Garland	£11.75	B,B+,Electron	Sec	Ь	Mole Concept	BBC	£13.04	В	Sec	c
Introductory Genetics	Garland	£17.25	В	Sec	ь	Moving Molecules	Cambridge Micro	£15.95	B,Econet	Sec	C,S
Kidney Nephron	Longman	£20.13	В	Sec	ь	Nelson Advanced Chemistry		£30.48	В	Sec	C
Lake Web	Solent	£12	B B	J/S- 1/S	b,s	Organic Analysis	Longman Longman	£20.13 £20.13	B,Econet B	Sec Sec	c
Leaves Metabolic Pathways	Heinemann Longman	£13.80 £20.13	B,Econet	Sec	b,x b,s	Organic Synthesis Passit Inchem	Ed Soft	£7.95	В	Sec	c
Microcomputers in Biology	IRL	7.61.19	B,Econet	Sec	b,ll	Passit Redox	Ed Soft	7.5.95	B	Sec	C
Microdiet	Longman	£31.63	B,Econet	Sec	b,ff	Periodic Table of the	Peter Sharpe	£4.95	В	Sec	C
Moths, Mice and Other	Longman	£20.13	В	Sec	b	Elements		COO 42			
Beasties	1	C20 12	D F	0	1	Periodic Properties	Hodder	£22.43 £34.50	B B	Sec Sec	C
Multifactorial Inheritance Muscle Contraction	Longman IRL	£20.13 £22.50	B,Econet B,B+,Econet	Sec Sec	b b	Physical Chemistry Pack Polymers	Longman BBC	£34.30	В	Sec	c
Naming Organic Compound		£28.75	B	Sec	b,c	Qbank Chemistry	In-sight	7.30	В	Sec	c,hh
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Nucleic Acid Structure	IRL	£25.08	B,B+,Econet	Sec	Ь	Reaction Maze	Nelcal	£24.50	B,Econet	Sec	c
Photosynthesis	IRL	£25.08	B,B+,Econet	Sec	Ь	Secondary Science	Heinemann Shards	£13.80	B B,Electron	Sec Sec	c,p,b
Photosynthesis Photosynthesis	Longman Garland	£14.50 £16.50	B,Econet B,B+,Electron	Sec Sec	b b	Science Stoichiometry of Ionic	Shards Nelcal	£6.95 £24.50	B,Econet	Sec	c
Physiological Simulation	Heinemann	£10.30	В	Sec	b	Compounds		2,500		14 //	THE PERSON
Plant Biology Disc	Garland	£34.50	В	Sec	b	Symbols Formulae and	Garland	£12.95	В	Sec	С
Plant Competition	Edward Arnold	£16	В	Sec	Ь	Valency	N. L. I	604.50	D.F.	c	
Plant Ecology	Earth Science	£15	В	Sec	b,ii	The Arrhenius Equation	Nelcal BBC	£24.50	B,Econet B	Sec Sec	C
Pond Animals Pond Ecology	Heinemann Longman	£10.93 £20.13	B B,Econet	J/S Sec	b,x b	The Periodic Table The Zantmann Experiment		£23 £24.50	B,Econet	Sec	c
Population Dynamics	Edward Arnold	£20.13	B	Sec	b,ii	Titrations Experiment	SYSTEM	114.95	B,Econet	Sec	c
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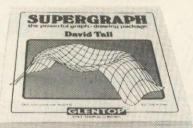
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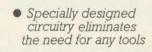
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efill .	Carsondale	£9.95	В	Sec	1	Logic Puzzles	Educational Software		В	J/S	n
ziehen	Cambridge Micro	€18.80	B,Econet	Sec	1		MUSE	£7	В	1/J	n
fill	CALL	£15	В	Sec	1	Mathematical Concepts	Drake	~Z8	В	I/J	п
gap	CALL	£10	В	Sec	1	Mathematical Investigations		£8	В	I/J	п
text	CALL	£30	В	Sec	1		Heinemann	£25.30	В	Sec	n
view	CALL	£10	В	Sec	l,aa	Mathemagic Land	LTS	19.95	В	J/S	n
bs	Sulis	£7.35	В	Sec	1		Acornsoft	1.12.65	B,B+	ec	- 1
ab Tester	Beebugsoft	£10	В	Sec	1	Mathematics Games and	Capital Media	£8	В	1/1	n
ab - European Language		728.75	B,Econet	Sec	1	Activities					
lmeister	Wida	£28.75	B,Econet	Sec	1	Maths 1	Tutorial	£11.95	B,Electron	Sec	1
dstore - European	Wida	7.28.75	B,Econet	Sec	1	Maths Level 4	Ginn & Co	£16	В	1/S	n
anguages		~				Maths Revision	Abacus	£12.95	В	Sec	n
						Maths Level 6	Ginn & Co	£16	В	J/S	п
						Maths "O"	Ampalsoft	£11.05	В	Sec	n
THEMATICS						Maths Master	GSN	£14.38	В	Ju	n
Level Maths	SUMS	£15	В	Sec	m	Maths with a Story	BBC	£10.95	В	1/8	n
anced Mathematics	Nelcal	£30.48	B,Econet	Sec	m		Ginn & Co	116	В	1/8	n
2,3,4&5		~				Maths Level 5	Ginn & Co	£16	В	1/8	n
ebra 'O' level	Ampalsoft	£5.13	В	Sec	m	Maths Snap	Sherston	£7.48	В	Ju	n
ebra Programs	Acornsoft	79.95	A,B	Sec	m		Cambridge Micro	(15.95	B,Econet	Sec	n
Aboard	Arnold Wheaton	€11.44	В	Sec	m	Maths Translations	Corona	[5	В	Sec	n
ha Graph	Arnold Wheaton	£9.95	В	1/S	m,u	Maths Talk	LTS	£5 £9.95	В	Ju	n
le Tutor	Pee Bee	7,9.95	A,B	1/S	m	Mathskills I & II	Griffin	£11.95	В	Sec	
gle	Chalksoft	£14.25	A,B	1/S	m	Mathsman	GED	£4	В	Ju	n
le Turner	Arnold Wheaton	£,9.95	В	I/S	m	Matrices	Bryants		В	Sec	1
gles/Navigate	Primary Programs	7.5.95	В	Ju	m	Matrices	Chaddington	£10	В	Sec	n
les Pupils Pack	S&S	£17.54	В	lu	m		Britannica	1.75	В	Inf	n
les Teacher Pack	S&S	£17.54	В	Teacher	m	Merlin Teaches Tables Pack	Hodder	£17.25	В	1/1	1
gles	Garland	£7	B,B+,Electron	Iu	m	Meteor Multiplication	Taskmaster	(9.95	В	lu	n
gles 1-3	Nelcal	(24.09	В	1/8	m	Metrics Quiz Plus	Chalksoft	£14.25	В	1/8	n
proximation, Estimation,		£20.12	В	1/8	m		LCL	A CONTRACTOR	A,B	Sec	п
td Form		2		31-	11,000	Microsmile 1 & 2	Centre for Learnin	g			
a	Greenwood	£.5	В	Sec	m		Resources	£15	В	1/1	n
ro Maths	Scisoft	£5	В	J/S	m	Middle School Maths	Scisoft	(6.95	В	1/S	n
ic Skills	Selective Software	14	B	1/5	m	Minus Mission	Taskmaster	79.95	В	1/1	r
rings	Nelcal	(21.79	В	1/1	m	Missing Signs	Acornsoft	£15.35	В	1/5	ī
t the Clock	Arnold Wheaton	£9.95	В	1/1	m	Mland	Greenwood	£13.33	B	1/5	r
Plot	BelTech	19.50	B,B+,Electron	Sec	m	Mmaths	Ed Soft	14.95	A,B,B+,Electron	lu	n
Boot	Highlight	16.95	B B	lu	m	Money Plus	Fernleaf	(31.26	B	LIS	1
fit	Greenwood	1.5	В	Sec	m,p		Shards	£6.95	В	1/1	1
ary Numbers	Chaddington	£10	В	Sec	m,p	Motion Geometry	Garland	77	B,B+,Electron	lu	3
ax - the Presfax	S&S	£10 £19.49	В	lu	m		Mupados	115.49	B	1/8	r
alculator		A. C. T.	***	7-	11956	Nightmare Maths	Logical	(7.50	В	lu	
culus "O"	Ampalsoft	£5.13	В	Sec	m,q		ESM	1.8.20	В	I/I	г
- Maths in Motion	Cambs Software	(18	В	Ju	m,q		ISMeC	100	В	Sec -	- n
tesian	Flite	£10 £24.90	B,Electron	Sec	m,u		Chalksoft	[.14.25	В	Ju	r
rds	Aztec	£6.50	B,B+	1/S	m		ESM (Shiva)	7.55	В	Ju	r
ordinates	Garland	77	B,B+,Electron	Ju	m		Scisoft	(.7.95	В	Sec	T
nA CoinB	Longman	(21	В	1/5	m	Ordering	ESM	1.14.95	В	1/1	T
ns .	ESM	£9.43	В	lu	m		Chalksoft	16.95	В	1/8	1
struction "O"	Ampalsoft	75.13	В	Sec	m		Ed Soft	75.95	B,B+	Sec	
nky	ASK	19.95	B,Electron	Ju	m	PEAC 2	RESOURCE	110.95	B	1/1	1
ssnumber	GSN	112.08	B	Teacher	m,q		ABC	(.8.50	В	Î/I	-
	S&S	£14.32	В	I/I	m,q	Picture Maths	Al	79.95	В	1/1	r
	ESM	£14.95	В	I/I	m	Pirates	Longman	(20.13	B,Econet	1/5	
imals	Longman	214.75	В	I/S	m	Placeval	Ed Soft	£20.15	A,B,B+	lu	
imals isions		£14.95	В	1/1	m m	Playing with Places	ESM	£4.95	B B	1/1	r
imals isions ccoin			В	In		Plotter Places	Selective	£14.93	В	I/S	n
imals isions ccoin erences	ESM			Ju Inf	m		Heinemann	£3.30 £18.40	В	Sec	
imals isions ecoin erences gon Mix	ESM Taskmaster	£9.95	AR		a,e						r
imals isions ccoin erences gon Mix y Learning	ESM Taskmaster BBC	£10	A,B		m	Primary Maths Pack	RESOURCE	£11.95	B	I/J	1
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cimals isions ccoin ferences gon Mix ly Learning ly Mathematics ly Years 1 & 2 iiplot uations Suite imation clidean Geometry dence	ESM Taskmaster BBC Heinemann Orion Synergy Garland Hodder Impact Longman	£10 £13.80 £7.95 £15.95	B B,B+,Electron B,Electron B	Inf Sec Ju I/J Sec J/S	m m m	Programs for Mathematical Computing Pythagoras' Theorem Quadratic Equations	MEI Griffin Longman	£5 £17.50 £11.95 £18.34	B B,B+Elk,Econet B B	Sec Sec Sec Sec	n n n
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cimals isions ccoin ferences gon Mix ly Learning ly Mathematics ly Years 1 & 2 iiplot uations Suite imation clidean Geometry dence	ESM Taskmaster BBC Heinemann Orion Synergy Garland Hodder Impact Longman	£13.80 £7.95 £15.95 £27.60 £9.95	B B,B+,Electron B,Electron B	Inf Sec Ju I/J Sec J/S	m m m m	Programs for Mathematical Computing Pythagoras' Theorem Quadratic Equations	MEI Griffin Longman	£5 £17.50 £11.95 £18.34	B B,B+Elk,Econet B B	Sec Sec Sec Sec	n

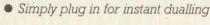
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Scottish Primary Maths	Heinemann	£56.93	В	J/S	m	Gaseous Diffusion	Longman	£34.93 £20.13	B,Econent	Sec	P
Group		~		**		General Physics "A"	Longman	£34.50	B,Econet	Sec	P
Secondary Mathematics Sets and Operators	Heinemann ESM	£13.80 £14.95	B B	Sec I/I	m m	Gravity Heating a Wire	Longman Longman	£20.13 £17.83	B,Econet B	Sec	Р
Shape Up	ASK	£9.95	B,Electron	Ju	m	Howe can faulty electrical	Modular	137.50	В	J/S Sec	P
Shape and Race	H&H	£5.50	В	1/J	m	components be identified?	16 11				
Shares for All Shoot	ESM Soft Centre	£14.95 £6.90	B B	I/J Ju	m m	How can nuclear instability provide source of energy?	Modular	£37,50	В	Sec	P
Signals and Magic	Н&Н	£5.50	В	J/S	m	Hydraulics	Database	£5.50	В	Sec	P
Simple Equations Sorting	Drake Drake	£8 £8	B B	I/J	m	Images	MagaCyCAL	£9.95	B,Electron	Sec	P
Slimwam 1&2	ATM	£17	В	Inf I/I/Sec	m m,ll	Interference and Diffraction of Waves	Edward Arnold	£16	В	Sec	P
Special Poducts	Impact	£14.95	В	Sec	m	Investigating Circuits	Longman	£20.13	В	Sec	P
Spider SPMG Metric Units of Weigh	Cambridge Micro	£11.71 £12.50	B B	1/J 1/S	m m	Isaac Lenses	Earth Science Heinemann	£14.95 £20.12	B B	Sec Sec	P
Squeeze	ASK	£9.95	B,Electron	I/J	m	Linear Motion	Wiley	£34.95	В	Sec	p p
Submarines Sum Un	GED	£4	A B Ulaman	Ju	m	Longitudional Waves	Heinemann	£14.38	В	Sec	p
Sum Up Supergraph	Learnwell Glentop	L4	B,Electron B	Ju Sec	a m,gg	Magnets Mass Spectrometer	Macmillan Longman	£6.95 £20.13	B B,Econet	J/S Sec	p p,s
Symbols	Britannica	£75	В	Inf	m,ee	Middle Secondary Physics	Longman	£34.50	B,Econet	Sec	P
Symmetry Table Test 1-4	Acornsoft Drake	£14.95 £8	B B	Sec Ju	m m	Pack Millikan's Oil Drop	GSN	(17.25	В	e	
Tables Adventure	ASK	£9.95	B,Electron	1/1	m	Experiment	GOIN	£17.25	D	Sec	P
Tables	AVC	£3	В	Ju	m	Models in Physics	Garland	£11.75	В	Sec	p
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Tablesums	Griffin	£9.95	В	Ju	m	Momentum and Impacts	Wiley	£34.95	В	Sec	p,s p
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Tecdy Tecdy	Longman	£8.50 £20.13	A,B B	I/J Sec	m m	Multiple Slit Interference Newton	GSN Edward Arnold	£17.25 £15	B	Sec Sec	p p
Tess	Н&Н	£7.50	В	J/S	m	Newton and the Shuttle	BBC	£23	В	Sec	p
Tessellations Tesselator	Cambridge Micro Addison Wesley	£23.43 £21.95	B,Econet B	J/S I/S	m m	Nuclear Reactor Simulation Nuffield Physics Pack	Longman Longman	£16.68 £34.50	B,Econet B	Sec	P
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Tick-tock Time	Nisbet S&S	£8.05 £17.54	B B	1/J	m	Definitions	ManaC CAT	-			
Times Tables	Aztec	£17.54 £3	B,B+	Ju I/J	m m	Operational Amplifiers Optics	McgaCyCAL MUSE	£12 £6.50	B,Electron B,B+	Sec Sec	P P
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Triangles	Chalksoft	£9.25	В	J/S	m	Physics Revision	Abacus	£12.95	В	Sec	P
Triangle Tutor Triangles/Regular Shapes	Pee Bee	£6.50	A,B B	J/S	m	Physics Disc	Garland	£31.75	В	Sec	P
Trigonometry "O"	Primary Progress Ampalsoft	£5.95 £5.13	В	J/S Sec	m m	Physics Suite 2 Physics	Griffin Garland	£12.95 £36.51	B B,B+,Electron	Sec Sec	P
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Venn Diagrams	GSN	£6 £14.38	B B	Sec 1/S	m m	Primary School Science Project	Glentop		B _ / =	Ju	p,b
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Wizard's Revenge	Sherston	£14.38	В	Ju	m	Projectiles Qbank Physics	Garland In-sight	£10 £30	B,B+,Electron	Sec Sec	p,s
						Radioactive Decay	Longman	£30 £20.13	B,Econet	Sec	p,hh p
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A to D	Herdman MegaCyCAL	£12.95 £12	B B	Sec Sec	P P	Reaction Kinetics Reilly	Edward Arnold Earth Science	£16 £12.95	B B	Sec Sec	p p
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D to A	MegaCyCAL	£12	В	Sec	P	Waves	BBC	£17.20	В	Sec	p,s
D.C. D-Logic	MegaCyCAL MegaCyCAL	£9.95	B,Electron B	Sec Sec	P	Waves Waves and Vibrations	MegaCyCAL Griffin	£9.95 £9.95	B,Electron B	Sec Sec	P
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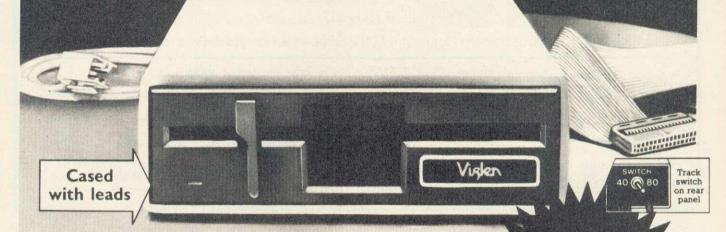
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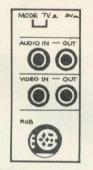
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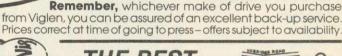
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BUSINESS

NEWS

Beeb's Swift spreadsheet

Audiogenic Software has converted its *Swift Spreadsheet* package to run on the Beeb. The software sells at £29.95 and comes on an EPROM.

It uses pop-up menus to allow easy access to the spreadsheet's commands and offers a sheet area of 3200 cells.

Other features include flexible cell formatting and a bar graph display option.

Contact Audiogenic Software on (0734) 303663.

Manager for 128

Contex Computing has released a version of its *Bank Manager* financial management package for the BBC 128.

It eliminates the disc overlaying necessary with the model B version by storing all the program in the 128's sideways RAM.

The price is £21.50, or £5 to users who return the old version to Contex Computing. Tel: (02303) 347.

Beebs go to press

by Geoff Nairn

Top British newspapers are looking at using BBC micros to replace their trusty – but rusty – Remington typewriters.

Over 90 representatives from provincial and national newspapers, including the *Daily Express* and the *Financial Times*, were due to attend a meeting of the Web Offset Newspaper Association (WONA) in Maidstone on March 18, where a BBC micro was being used to help produce a newspaper.

Mike Barnes, a typesetting consultant, was to show off his £1600 system, which consists of a modified Beeb and some typesetting software, hooked up to a phototypesetter.

This allows stories entered at the keyboard to be quickly turned into a forme – a photographic negative – ready for the printing presses and is cheaper than both the traditional hot metal process



Today: gone for the new technology

and dedicated computer terminals, said Mike Barnes.

A special newspaper was produced using his software at the Newstec exhibition last year (see page 9, Acorn User February '86) by journalists from the Kent Messenger. The Kent Messenger is hosting the WONA conference and has a BBC micro of its own

'knocking around somewhere', according to a spokesman.

Many provincial and national newspapers, including *The Times* and *Today*, have already plumped for new technology, but the idea of using cheap microcomputers is new and, according to Alan Shanks, secretary of WONA, it could revolutionise the industry.

He said: 'Dedicated systems, which cost £24,000, can be replaced by £5000 computers or wordprocessors.

'Newspapers will be able to set up anywhere with just a wordprocessor and a local instant print shop.'

Eddie Shah, proprietor of *Today* and a member of WONA, recently invested heavily in dedicated – and expensive – computer production equipment.

Pinched

But already the writing is on the wall, for BBC micros are used by two *Today* contributors to send in copy over the phone lines. Apple and Tandy micros are also used at *Today*.

Chris Curry, co-founder of Acorn Computers, has pinched 12 former employees who helped build the Acorn Communicator – including the two bosses – and has set up a new company, General Information Systems (GIS), at Croxton Hall, his Cambridgeshire country manor.

He is understood to be developing the Communicator for use as just such a newspaper production tool, though Ramanuj Banerjee, former technical manager of the Communicator project at Acorn, would not comment on the proposed activities of GIS.

Scottish bank breaks into market

The Bank of Scotland is looking to break into the English market using its electronic banking service, HOBS, as a spearhead.

The service, launched last year, was originally aimed at microowning private customers but was revamped for businesses.

It allows them, by using a micro or Prestel terminal, to pay suppliers, transfer money from current accounts to interest-bearing investment accounts, obtain statements and, by showing cleared balances, project their cash positions.

A Bank of Scotland spokesman

told AU: 'The level of interest in the service has been very encouraging, certainly in the thousands, but it's too early to say how many people will actually sign on the dotted line.'

Foothold

HOBS allows the Bank to gain a foothold in the booming English retail banking sector, and is certainly cheaper than the more conventional way — buying High Street sites.

The Bank said: 'There are too many players in the Scottish banking market, so we decided to expand South of the border, where the Big Four (main UK clearing banks) have had the market to themselves for too long.'

HOBS – Home and Office Banking Service – is available to domestic customers for £5 per month – plus Prestel and telephone charges. The full money management service for businesses costs £20 per month. A Prestel adaptor is available for £90, but most of the customers using HOBS to date had their own.

A similar service, run by the Midland Bank, has been particularly popular with Beeb owners.

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BUSINESS

NEWS

One-to-One starts battling

The battle for electronic mail customers hots up as One-to-One cuts its charges and expands its services.

One-to-One is one of the four main e-mail suppliers fighting it out in the UK – each with incompatible services. The others are Comet, Easylink and market leader Telecom Gold.

One-to-One has dropped individual message charges – previously 5p or more – for its 6000 subscribers and has added a viewdata port, allowing those with Prestel terminals to use the service. There is still a time charge of 10p per minute and a £50 one-off charge for each mailbox.

It has also added a noticeboard, 121World, where 'for sale' notices and general business information can be posted free of charge.

The changes are an attempt to reach large corporate users, where One-to-One has been under-represented; most of its customers are small businesses, using the service to provide low-cost access to the much larger Telex network.

Rivals

British Telecom was unimpressed with its rival's moves and its Telecom Gold tarifs stay the same – higher than One-to-One's. Instead BT hoped that its recent commitment to the X400 technical standard for e-mail would get customers signing up.

Telecom Gold MD, Peter Burry, said: 'X400 is the most significant development in electronic mail and we will see the first practical implementations of the standard later this year.'

Telecom Gold tarifs are: up to 11p per minute useage charge, 20p per month storage charge for the equivalent of a side of A4, and a £300 subscription for corporate customers, allowing unlimited mailboxes. 'Club users' pay only £40 per mailbox.

Video from Ivan Berg

by Geoff Nairn

Ivan Berg Software is the latest contender in the interactive video market with a tape-based BBC micro system, the Take Five.

Aimed squarely at industrial training applications, the Take Five allows material recorded on standard Betamax format video tape to be turned into an interactive training course with questionand-answer frames supplied by the BBC micro.

The Take Five systems costs £2933 which includes a modified Beeb with dual disc drives, a Sony colour monitor and a Sony Betamax recorder – though U-Matic is available as an option.

Acorn spurned video tape and went for a Philips videodisc-based system for its attempt to conquer this burgeoning market. Such systems require purpose-made video discs and cannot record.

The Acorn system, called Master Video, now features a Master 128 and a Philips or Pioneer laser disc player, and sells for £3220. There is also a more compact version for £3750.

Acorn Video, a subsidiary of Acorn Computers, claims to have sold 30-40 video systems, mainly for commercial training and point-of-sale applications.

However, to date, few large customers have placed repeat or-



Take Five: the latest contender in the interactive video market

ders after buying an initial trial machine from Acorn, and Lloyds Bank, looking to buy 1500 machines for staff training, rejected their two Acorn machines and chose a dedicated system from Video Logic.

Complaint

One complaint has been that the picture on the Acorn system is unsteady – a complaint traditionally levelled at tape-based systems. Chris Turner of Acorn Video blamed the technical problem and the loss of the Lloyds Bank contract on the turmoil Acorn went through at the beginning in 1985.

He said: 'We just couldn't offer the support or commitment. Now we have every chance of winning such a contract on technical and commercial grounds.'

Acorn was to supply the hardware and software for the BBCproduced video discs in the BBC's ambitious Domesday Project. However, because of Acorn's plight last year, the BBC took over writing the retrieval software, which is stored on the videodisc.

The project has slipped behind schedule but hardware, software and videodisc should be ready for November.

Chris Turner said the company was looking at the possibility of making an IBM PC-based interactive video system, as many of its largest potential customers had a 'buy IBM' policy.

But the Acorn-based machine would not be dropped, he added.

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3	Beyond Basic	BBCSoft	£11.50	_		_	Yes	J	
4	Wordwise	Computer Concepts	_		£56.35	-		-	
5	Wordwise +	Computer Concepts		-	£56.35			Yes	-

Compiled by Gallup/MicroScope. * Contact publisher: Database Publications, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY. BBCSoft, 35 Marylebone High Street, London W1M 4AA. Tel: 01-580 4468. Computer Concepts, Gaddesden Place, Hemel Hempstead, Herts HP2 6EX. Tel: (0442) 63933.



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PROCESSING FROM THE WORD GO

In this first of an occasional series of articles on wordprocessors and wordprocessing, advice for disc users is offered

Jacquetta Megarry

Most people who use their Beeb for wordprocessing soon find they need a disc drive. For this wordprocessor article, therefore, I'm starting with advice for disc users that applies whether you favour *View*, *Wordwise*, *Wordwise* Plus, Scribe or another system.

You'll quickly find that you fill discs faster than you thought possible! Decide your policy on disc management on the following: how often to save and how many backup copies to keep; how often to weed out and tidy up your discs; how to arrange documents on discs and how to keep track; whether and how to use directories (see below); and how to give your files short but meaningful names.

Sooner or later you'll find that a file (or even a whole disc) has been corrupted. How you feel about this will depend on whether it was a long-dead letter or the priceless text of your first novel of which you have no hard copy. If you're sensible about handling discs, you may have no problems for months or years, but Murphy's Law suggests that if you do have a disaster, it will inevitably be to something that cost you blood and sweat to write.

Basic precautions

The most basic precaution is to save anything important twice onto two separate discs: if one gets destroyed you have a good chance that the backup disc hasn't. If you compose at the keyboard you'll have no other copy of your text, so it's also a good idea to print at least a rough copy before switching off. You should save before you print, as text can be lost at the touch of Break while printing.

Don't wait till you've finished a document to save it: a power cut can wipe everything out. Depending on your habits and system, you may find frequent saves distracting. Personally I save every hour or so and every time I have to break off for a cup of tea.

Don't fall in the trap of storing intermediate versions of the same document. It just uses up disc space and if you're not careful you can waste ages trying to work out which is the current version. Unless you'll need a previous version again, overwrite the old with the new by saving it with the same filename. In Wordwise and View you get no warning that

you're about to wipe out the old file: if this causes you problems, lock valuable files using *ACCESS file name L. *Wordwise Plus* checks first with 'Replace old file?'.

It's sensible to weed out unwanted files as soon as you can, as you'll forget what document the filename stands for, and have to load the text back in before deciding to delete it – fairly quick with *View* and *Wordwise Plus*, but slow with *Wordwise*. Use *DELETE followed by the filename unless you're confident of the more drastic ways of deleting files. After a deleting session is the ideal time to tidy up the disc using *COMPACT. Make sure you've saved any text in memory first, though, as *COMPACT will clear it!

You may compose a variety of document types: letters, memos, minutes, address labels, reports, articles, even booklets or books. Perhaps you also store programs written in languages such as Basic, Logo or *WordPlus*. Try to avoid mixing different types of document, or documents with programs, on a disc.

Label each disc clearly with the document type, and resist the temptation to use it for anything else. Record the category name (up to 12 characters) on the disc using *TITLE. For example *TITLE mail_labels1 might title your first address labels disc. Keep a written record of the disc catalogue with the disc. Most systems let you print one in Command or Menu Mode by enabling the printer (which must already be switched on and on-line) with CTRL-B, then *CAT (or *.) and finally CTRL-C to disable the printer.

If you keep different file types on different discs, you may not need to bother about directories. But not everyone finds this easy, and directories are important to enjoy fully the benefits of the Advanced Disc Filing System (as supplied in the master).

A directory is a way of labelling files on a disc so that those which belong together appear together in the catalogue and are easy to copy and delete as a group. Each directory is like a ring-binder labelled with a single character: almost any keyboard character will do, but most people use letters. If you only had one disc for all your files, therefore, you could use the B directory for Basic programs, the L

directory for letters, M for memos, R for reports and so on.

To change from the current directory (which is \$ by default) to directory R, simply type *DIR R. To return to \$, type * DIR \$. You can save a file called report1 to the R directory while still in \$ by typing its filename preceded by R. – R.report1.

Clever filenames

Devising a helpful filename within seven characters can be quite a challenge. Clever coding systems can be difficult to crack weeks later, and shortened filenames can be hard to type and remember: 'consons' is a better abbreviation for 'consonants' than 'cnsnnts'. Never include spaces, but you can use hyphens and most punctuation marks if you want (but avoid full stops on networks).

It's worth including the filename as part of a draft document. Wordwise Plus users can do this automatically with the embedded command < f1 > ps F\$ < f2 >. You can always delete the filename before your final printout.

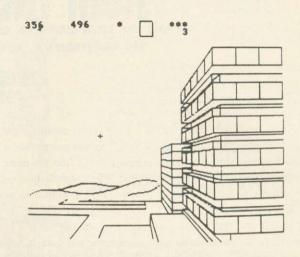
If you want to include the date in a filename, give the month before day so that the files will catalogue in sequence. If you need to include the year, code it (6 for 1986, 7 for 1987) before the month. Thus on May 8 I might save a letter as jm60508 while tomorrow I might use jm60509, and so on. Avoid using numbers at the beginning of a filename, especially in *Wordwise*, as it's easy to mix them up with the menu numbers.

If you've got a Master 128, you've already got *View* built-in, and documentation of a kind is given in the Welcome Manual. One of many things it doesn't tell you is how to access the real-time clock/calendar (CTRL-T for time, CTRL-D for date) within *View*.

And if you still prefer Wordwise to View, you need Wordwise Plus version 1.4D or later, distributed as standard since around January 1986 (contact Computer Concepts if you need to exchange versions). Since *WORD selects View, you'll need to type *WORD. (or *WORDWISE) to get Wordwise Plus. Wouldn't it be lovely if Computer Concepts seized the chance to do a cheap disc version of Wordwise to run in sideways RAM?

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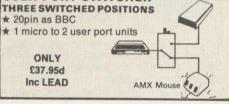
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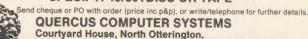
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ACORNFORUM

In this forum for owners of Acorn micros, Mike Barwise concludes his series on discs and a daisywheel screen dump is presented

KEEPING TRACK OF THE DISCS

From the point of view of performance, the most interesting feature of the IBM format for discs is the sector numbering (see last month's Acorn Forum). Sectors are usually numbered consecutively within a track, and in the Acorn system they are numbered zero through nine.

However, it isn't obligatory to start each track with sector zero; in fact, just numbering the sectors of each track zero through nine starting at the index hole each time would lead to a very inefficient system.

This is because of the relationship between the drive head stepping time and the time taken for a sector to pass under the drive head. Assuming the sectors are evenly disposed throughout the track (they are not, but the discrepancy is very small in Acorn format), each sector takes one tenth of a revolution at 300rpm or 20 milliseconds to pass under the drive head. The head step time varies from drive to drive between three and 30 milliseconds, and there is an additional settling time of between 12 and 45 milliseconds to allow for vibration due to the inertia and elasticity of the head stepper mechanism to die away.

Painfully slow

Assuming a mean case of a 12ms step and 12ms settling time (24ms total), we read our first track. Having read sector nine, we step the head to the next track. Sector zero must be read first, but we have taken 24ms to get to the track. As sector zero started effectively on the same radius as sector nine finished, we now find that sector zero has gone past, and so has part of sector one. The remaining four-fifths of a revolution must now take place before sector zero comes under the drive head again, so the real time between reading tracks is about a fifth of a second (200ms) instead of 24ms.

If we are clever during formatting, though, and start numbering our sectors on the second track from number eight at the index hole, through nine, zero, and so on, the correct sector will be just about to pass under the drive head as the step and settling time end. This is the concept of 'sector stagger'. Every track from one onwards starts at its index hole with a sector number which is n less than the previous track start sector.

Ideally, stagger should be fine-tuned to an individual drive step rate and settling time. However, this would oblige the user to stick with a given drive system and with discs formatted on that system, or pay a heavy penalty in loss of efficiency. Acorn has again come up with an excellent compromise. The Acorn stagger of minus four (stagger should always be expressed as minus something) allows step-plus-settling totals of up to about 75ms to be accommodated. This covers most low-cost new systems and practically all old full-height drives. With really classy units like half-height Teacs, it's possible to reduce the stagger to minus three or even minus two, provided the step rate of the floppy disc controller chip (FDC) can be set to match the optimum drive step rate. The performance increase is quite dramatic, with a trade-off of limited interchangeability. If in doubt, too much stagger is better than too little.

Of course, there is no way of tuning the stagger so that the first sector matches the first track of your file after the primary seek form the disc catalogue. The best you can do is set up your system to match the drive step rate as nearly as you can so this seek is as fast as possible. BBC micro users should set the links or DIP switches along-side the keyboard to suit the slowest drive in the system. Atom users with Disc Packs really have no control, as the step rate and settling time are coded as literals in the DOS. Bear AFDC users can set up the step rate for each drive individually, but the settling time is fixed at 30ms.

Now that the basics of the ID structure have been explained, we move on to how you can play with discs at the sector level.

All IBM-standard FDCs have certain things in common. They all expect you to provide them with a track number, a sector number, and an opcode telling them whether to read or write. The architecture of different chips varies, so the syntax will vary too, but fortunately we have to deal with just two alternatives: the Intel 8271 and the Western Digital family. Various independent FDCs for the BBC micro have used different members of the WD family, but their command structure and codes are practically consistent, so these notes apply to the 179x series, the 279x series and the 1770.

The Intel 8271 has a command/status register, a general parameter/result register and a data register. Commands are sent by writing

the opcode to the command register while the FDC is not busy, followed by a variable set of parameters to the parameter register. There is a fairly involved initialisation sequence to be performed on start-up or after reset, as all the drive parameters and some parameters not used on Acorn systems must be loaded into the FDC by a 'specify' command. This makes working outside a DFS rather cumbersome. Parameters for data-processing commands always include the track and sector number so that a single opcode performs the seek and the read or write operation. Any errors are reported in the result register. The data transfers are performed through the data registers (read or write) - on Acorn systems, the data transfers are synchronised by use of the NMI interrupt.

Features unique to the 8271 include a 'fixed-length key scan data' operation and a 'read IDs from track' operation.

The Western Digital FDCs have a much simpler architecture and command structure. There are four read/write registers: command/status, track, sector and data.

Information on errors

The standard syntax is: load track register, send seek opcode, wait for completion, load sector register, send read or write opcode. Data are then presented through the data register in the relevant direction, and on termination the status register provides information on any errors. The WD series allow the user to read the first encountered ID after the index hole on any track, and also to dump an entire track to memory including all gaps, ID headers and CRCs. This allows corrupt discs to be recovered if you know how. Remember that you will need about 3200 bytes in single density and abut twice this in double density in which to store the data.

Details of all these commands can be found in the manufacturers' data sheets, which should be studied carefully. If you don't understand what you're doing, you can do a lot of damage to your data by thumping around at sector level because there's no error protection. However, once you have taken the plunge, data can be stored on discs without catalogues by the simple method of saving it up in a 256 byte buffer and sending it to specified sectors. The Acorn 10-sector track lends itself to working in decimal numbers, as the track and sector can be calculated directly



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ACORN FORUM

from the absolute sector number by decimal division in Basic. An NMI service data transfer routine will be needed, but all other operations could be performed (rather slowly!) from Basic by using the? operator. There are many applications for this kind of disc storage, mainly in the field of true random access.

Finally: the only thing you can spoil by poking around the FDC is disc data. You can't really damage your micro or your disc drives by mistakes at machine level, but you mustn't try to seek past the number of real tracks on vour drive.

All drives have a springy end stop to allow for the occasional over-seek, but bashing on it will mis-align the drive head. The rule is: if it rattles, hit Break.

DUMPS ON A DAISYWHEEL

The problem with daisywheel printers is that you can't print graphics. Until now, that is! With the help of this little program (listing 1) from Dave Atherton, your daisywheel printer can produce quite acceptable screen dumps. Daisywheel printers don't have definable graphics so the full stop character is used to produce the dump.

The program works by scanning the screen (or a section of it) using the POINT command and printing a full stop every time a dot is detected. To start with, a screen image is loaded from disc (line 80), although you could create something on screen with some lines of code instead.

The area of the screen to be dumped is set in

```
10 REM Daisywheel Screen Dump
20 REM for Brother HR15, Juki etc.
30 REM by Dave Atherton
40 REM for BBC/B+/M128/Electron
50 REM (c) Acorn User
 60 :
70 MODE4
 80 *LOAD Screen FFFF5800
 90 :
100 size=1
110 x1=0:y1=0
120 x2=1279:y2=1023
130 margin=20
140
150 PROCsetprinter
160 VDU 2
170 FOR Y%=y2 TO y1 STEP -4
180 VDU 1,13
190 FORI%=1 TO margin: VDU1,32: NEXT
200 FOR X%=x1 TO x2 STEP 4
210 dot=POINT(X%, Y%)
220 VDU 1
230 IF dot=1 THEN VDU 46 ELSE VDU 32
240 NEXT X%
250 NEXT Y%
260 VDU3
270 PRINT TAB(0,30) "Dump done": END
290 DEFPROCsetprinter
300 VDU 2,1,27,1,&1F,1,4*size
310 VDU 1,27,1,&1E,1,2*size,3
320 ENDPROC
```



A daisywheel screendump!

lines 110-120 and line 130 sets the margin on the paper (in dots, not character spaces). PROCsetprinter programs the printer to do very narrow character spaces, and very short line feeds. These codes are for the Brother/Juki range of printers, but other daisywheels should have similar codes. The setting shown is 1/60" character space and 1/48" line feed.

Lines 170 to 250 perform the scan. In the listing, which is designed to run in mode 4, all colours except the background will appear as black. By altering line 230 to, say:

IF P% = 2 OR P% = 4....

selected colours can be dumped. It's also perfectly possible to run the program in other screen modes.

When using the program, it's good to put a couple of pieces of paper behind the one you are printing on, as the hammering effect of the full stop can easily wear its way through to the printer platen. Also you will probably find that carbon ribbons tend to give a slightly better image, as indeed they do in text printing.

You may find that the image produced is a negative of that required. If this is the case, change the value of 'dot' in line 230 to 0.

NEW VIEWS ON LIFE

The View function keys can be set up to hold whatever strings and commands you wish. To do this enter command mode and type:

*FX228.1

Function keys can then be defined as usual:

*KEY 0 "Acorn User"

Acorn User can then be inserted into your text anywhere you want, just by pressing the CTRL, Shift and function key 0 keys together. For regularly used key definitions, why not include them as part of your !BOOT file? Remember to include *FX228,1 though!

You can prevent a block of text being reformatted by the Format command by inserting a ruler with no right-margin '<' character immediately before it.

When you alter the page format of some text, the format of the first printed page is not always affected.

To make sure this doesn't happen ensure that you don't have any blank lines or text lines before any of the commands. If you do, the computer will print them before executing all the commands, so the commands will not take effect until page two.

Alternatively a separate file called COM-MAND can be set up which contains only the command lines. Then on printing type:

PRINT COMMAND TXTFILE and the COMMAND file will be executed followed by the printing of the textfile, TXTFILE.

You could of course include a variety of commands in various command files and use the one you require before you print your text file. This has the advantage in that you only need to define your commands once.

You can save part of a large document by first setting markers 1 and 2 at the extremes of the text you wish to save. Then enter command mode and type:

WRITE name 12

which will save the text between markers 1 and 2 under the filename given by 'name'.

If you omit marker 1 you can save all text up to marker 2; if you miss out marker 2 you'll save all text after marker 1.

You can insert a file into a current document by setting marker 1 at the point you want the file to be inserted, then going into command mode and typing:

READ name 1

The Read command can also be used to load in text SPOOLed form Wordwise.

One use of View's 26 number registers (September '85, Wordprocessor Hints and Tips) is to allow you to relate your page numbering to chapters, by setting up registers C and P at the start of each chapter. Type:

SR C|C+1

SPP1

Page numbering could then be started by using a command such as:

DF //Page C. P//

The pages in chapter 2, for example, would now be numbered 2.1, 2.2, 2.3, etc.

When using the Screen command, View turns paged mode on, so giving you a page of text at a time.

Paged mode can be turned off with CTRL-O. Pressing CTRL-N will turn it back on.

Listing 1. Daisywheel screen dump

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Triple contains Twin to backup valuable protected discs, Digger to display format information and contents of all readable tracks (and alter it if desired), and Dual to create your own 40/80 track discs. £10. Twin alone, £7. John Connett, Dene Croft, Westcott Street, Westcott, Dorking, Surrey RH43NY

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■ BBC model B OS1.2, Acorn DFS, manuals, magazines £250. Ramamp 32k sideways RAM/ ROM with write-protect switches. Cost £59, accept £25. Durham (0385) 711236.

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■ Walters WM2000 printer £150. Solidisk 32k SW RAM £35. R Hermon, International School of London, Crowndale Road, NW1 1TR.

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Basic Editor, Machine code utility provides fast editing of Basic. Supplied on 40 track disc. PO/cheque £5 inc or sae for details: J Smith, 1 The Gardens, Stotfold, Hitchin, Herts.

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DIARY

Disabled by shy Hermann

Some people aspire to fame and notoriety, others have it thrust upon them. Two in the latter category are Messrs Hermann Hauser and Chris Curry.

A more shy and retiring pair would be difficult to find, and vet their names crop everywhere.

One of the latest cropping-ups is in the Morley Teletext Adaptor ROM, as pointed out by reader Brian Sharrocks. The command to disable the chip is *HERMANN, and, so we are reliably informed, there is a Kid Curry in there somewhere too!

Communicating with the kid

On the subject of the Kid, it's getting a bit difficult to work out how grata a persona he is at Acorn. Since snaffling all the Communicator team from Cherry Hinton (a big leak from the Waterworks?), Mr Curry has had cause to install an Econet at his baronial Croxton Hall mansion.

And where did he go? Why, SI Research of course!

Front page news

What do you think of our 'Murdochsoft' page in a Fleet Street Editor style? Sent in by someone who wanted to remain anonymous, it was done on Pagemaker with a mouse.

Astronomic bang

One launch which went with a bang recently was Cumana's Astron card. The assembled scribes were having their individual cards (blown on a BBC micro)





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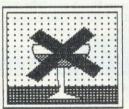
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What's in it for me? A quick look round



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read and dumped to an Epson printer through an intelligent black box when a bulb fell from a chandelier at the Gloucester Hotel. Bang! The bulb hit the (luckily thick) carpet, narrowly missing an assembled group, and a whole section of lighting was plunged into darkness.

The Swedish government ap-

parently asked for a quote for eight million cards, which, Don Bolton pointed out, is about the population of the country! 1984 might be late, but it's still coming.

Ultimate answers

Ringing round to try to sort out software compatibility is an arduous task at the best of times, but some companies act plain stupid. Take Ultimate for example.

Their response on Nightshade, a great game and a big seller, went like this:

Electron, 'no'; B+, 'possibly, but no guarantee'; Master, 'never heard of it.'

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